THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. SEPTEMBER 9, 1897. CHICAGO, ILL. NUMBER 36.

MAGNOLIA METAL. BEST ANTI-FRICTION METAL For All Machinery Bearings. MAGNOLIA METAL CO. Owners and Sole Manufacturers. FOR SALE BY ALL DEALERS. 266 and 267 West St., NEW YORK. CHICAGO: Traders' Building. LONDON: 49 Queen Victoria St., E.C.

Moore's Anti-Friction DIFFERENTIAL CHAIN HOIST.

Adjustable Automatic Brake.
Self sustaining at every point.
Highest Efficiency
A New Movement.
A Perpetual Compound Lever.
Powerful, Simple and Durable.
Light, Compact and Strong.

NINE SIZES.
Half Ton to Ten Tons Capacity.

ALSO
HAND POWER CRANES, WINCHES, &c.

Moore Manufacturing Co.,
MILWAUKEE, WIS.

FORSTER, WATERBURY & CO.
INCORPORATED.
PIG IRON, STEEL, ORE, COKE.
636-638 Rookery, CHICAGO.

THE CHICAGO SCREW CO.
TRADE MARK
SCREWS
94-108 W. WASHINGTON ST. CHICAGO

DICKMAN & MACKENZIE,
CLEVELAND, 71 Atwater Bldg.
CHICAGO, 1234 Rookery Bldg
Mining properties examined. Ores sampled at mines, furnaces and all lake ports.
General analyses of Ores, Slags, Metals, Fuel Foundry Materials and Products, etc.
CHEMISTS AND ENGINEERS

"CAHALL" VERTICAL WATER TUBE BOILERS MANUFACTURED BY THE AULTMAN & TAYLOR MACHINERY CO. MANSFIELD — OHIO "BABCOCK & WILCOX" HORIZONTAL

SEND FOR CATALOGUE.
CAHALL SALES DEPARTMENT,
Bank of Commerce Building, PITTSBURG, PA.
145 Taylor Building, New York City, N. Y.
The "Rookery," Chicago, Ill.
71 Perin Building, Cincinnati, O.
10 Peninsular Bank Bldg., Detroit, Mich.
826 Cuyahoga Bldg., Cleveland, O
712 Union St., New Orleans, La.
642 Drexel Bldg., Philadelphia, Pa.
1015 Tremont Bldg, Boston.

ENTERPRISE BOILER COMPANY
YOUNGSTOWN, O.
Draught Stacks, Blast Furnaces and Heavy Plate Work a Specialty.
Write for Estimates.

METAL STAMPING.
We do all kinds of SMALL STAMPING and FORMING, from Steel, Iron or Brass, from your Dies or we can make Dies for you.
Send sample or sketch for price.
THE OLIVER P. CLAY CO.
416 Arcade, Cleveland, Ohio.

SHULTZ PATENT SABLE RAWHIDE BELTING.
SHULTZ BELTING CO.
SHULTZ PATENT WOVEN LEATHER LINK BELTING
DYNAMO BELTING
ST. LOUIS, MO
New York Boston. Philadelphia.
Cleveland Tool and Supply Co., Agts. Cleveland, O.

HAND POWER BELT HOISTING MACHINERY CRANES STEAM ELECTRIC
THE CASE MFG. CO. COLUMBUS, O. U.S.A.

See Advt. PERKINS POWER PRESSES, Page 35.

The A B C of Iron, Now $1.

POWER TRANSMISSION
W. A. JONES FOUNDRY & MACHINE CO.
53-59 So. JEFFERSON ST. CHICAGO

WORKS, SHAKUN. MINES, CLEARFIELD CO., PA.
James V. Rose.
. . . PROPRIETOR . . .
SHARON FIRE BRICK WORKS,
Contractor in Fire Brick Construction.
Manufacturer of High Grade Fire Brick.
ANALYSIS:

Brick.		Rock Clay.	
SILICA,	54-50.	SILICA,	47.00.
ALUMINA,	44-30.	ALUMINA,	35.00.
LOSS ON IGN,	.05.	LOSS ON IGN,	13.20
IRON,	.15.	IRON,	.12.

SHARON, . . . PA.

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.
The Iron Trade Review

AN ARCHITECT
knows that Apollo galvanized iron is never rolled one gauge and stenciled another.
Builders ought to.
Apollo Iron and Steel Company, Pittsburgh, Pa.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

See large Advertisement of
B. F. STURTEVANT CO.,
Boston, Mass.,
On Page 25.
BLOWERS, FANS, ENGINES.

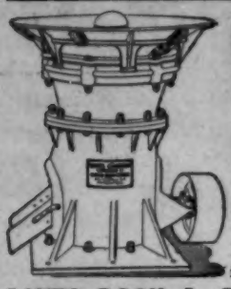
THE UPSON NUT CO., Cleveland, O.
. . . MANUFACTURERS OF . . .
MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS, BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

Draft Stacks, Galvanizing Pots, Tank Cars.

WM. B. POLLOCK & CO.

P. O. Address, HASELTON, O. Works at YOUNGSTOWN, O.

Blast Furnaces, Steel Plants, Boilers, Tanks, etc.



CRUSHING... FORCE

properly applied to your ore, placing it in condition to command the highest market price, is found to the best advantage in the

GATES ROCK & ORE BREAKER.

It is unequaled in economy, wearing qualities and crushing capacity. Over 4,000 in use. Write for catalogue.

GATES IRON WORKS, Dept. XX, 650 Elston Ave., CHICAGO, ILL.

The A B C of Iron,

NOW $1.00.

STILWELL'S

PATENT LIME-EXTRACTING

HEATER AND FILTER

COMBINED.

Is the only lime-extracting Heater that will prevent Scale in Steam Boilers, removing all impurities from the water before it enters the boiler.

Thoroughly Tested.

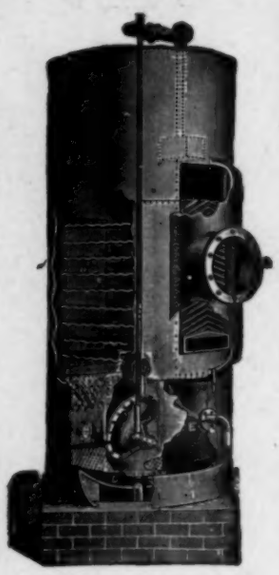
OVER 8,000 OF THEM IN DAILY USE.

ILLUSTRATED CATALOGUE.

Stilwell-Bierce & Smith-Vaile Company,

DAYTON, OHIO.

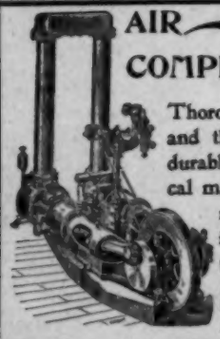
CHICAGO OFFICE, 63 S. Canal St.



The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

AIR COMPRESSORS



Thoroughly up-to-date and the most simple, durable and economical machines on the market. Built on improved lines.

ROCK DRILLS, AIR LIFT, PUMPS, ETC.

Send for catalogue

RAND DRILL CO.

100 Broadway, New York. 1328 Monadnock Block, Chicago.

JUST ISSUED. Catalogue No. 9.

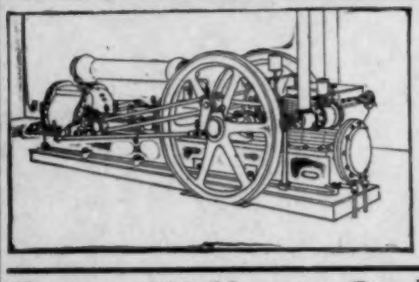
Clayton Air Compressors

And mailed FREE on application.

Special Air Compressors for all R. R. Car Shop Uses.

Clayton Air Compressor Wks.

26 Cortlandt St., NEW YORK.



We will send to Engineers and Business men, our circular No. 15, upon Air and Gas Compressors for all purposes and for any desired pressure and volume.

THE NORWALK IRON WORKS CO.

301 Water St., SO. NORWALK, CT.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stamps Seals, Stencils, Automatic Check Punches and Numbering Machines. 42 Seneca St.

O. TEXTOR,

Chemist and Metallurgist

Analyses made of Metals, Ores, Fuels and Supplies for Furnaces, Steel Works and Foundries.
Ores sampled at mines, furnaces and lake ports.
Advice furnished to operators of Blast Furnaces Steel Works and Foundries.
Mining properties reported upon.
For 12 Years Chief Chemist to the Cleveland Rolling Mill Co.

158 Superior St., CLEVELAND, O.

Robert W. Hunt & Co.

1137 The Rookery,

CHICAGO.

Analyses of Iron Ores.
Sampling of ores.
Analyses of all ores, oils, waters, metals, etc.
Inspection and consultation.

F. A. EMMERTON,

Analytical Chemist

AND METALLURGIST.

Ores sampled at lake ports, mines and furnaces.
Mines and Metallurgical Processes examined.
Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.

9 Bratenahl Building, CLEVELAND, O.

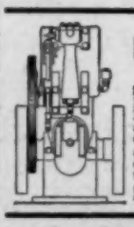
Pickands, Brown & Co.

PIG IRON, IRON ORE

...AND...

FRICK COKE.

929-939 ROOKERY BUILDING, CHICAGO.



PROUTY

Electro-Gasoline Engine

2 to 50 H. P.

Runs without smoke, odor or noise. Special styles for Electric Lighting, Boats, Mining Locomotives, Hoists, Portable, Threshing, Pumping, Farm and Dairies, Inspection and Street Cars, Road-Wagons, Printing Offices and all stationary purposes. All engines guaranteed and may be returned at our expense if not as represented. THE PROUTY CO., 79 Dearborn St., CHICAGO, U. S. A.

Extra Heavy Rough or FINISHED BRASS UNIONS. BRASS & PHOSPHOR BRONZE. Castings for all Purposes. Special finished brass work to order.

NOLTE BRASS CO.,

65 and 67 E. Washington St., Springfield, Ohio.

Wire Nail Machinery

30-INCH CHUCKING LATHES.

RADIATOR LOOP BORING MACHINES.

Wm. Glader, 160 & 162 So. Clinton st. Chicago

C. K. PITTMAN,

SHIPPER OF

Coal & Coke

Best Grades of Coke a Specialty.

975 Old Colony Building, Chicago.

THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. SEPTEMBER 9. 1897. CHICAGO, ILL. NUMBER 36

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The chief developments of the week have been rather in primary materials—an advance in foundry irons, notably in the Southern product, and in iron ore, further progress on a deal that promises to make the Carnegie Steel Co. a miner of old-range as well as of Mesabi ores. This movement is highly significant and the effect its consummation will have upon association plans for next year is a matter of great interest to the trade. Southern irons are now firm at 25 to 50 cents a ton advance over prices of two wekes ago and the reported purchases by an outside speculative interest at New York have assisted in establishing a higher basis. Quotations are now $8 for No. 1 foundry, $7.50 for No. 2 and $7.75 and $7.25 respectively for No. 1 and No. 2 soft, Birmingham. There is no uniformity as yet, but sales of good aggregate have been made at the higher figures, which are supported by the inability of nearly all Southern producers to make any considerable shipments of prompt iron. Northern foundry irons have not advanced proportionately, except in the Chicago district, and while the attitude of Southern sellers has convinced many foundrymen that purchases are well made now, competition among Northern furnaces has made uneven prices. Yet in all markets the lowest quotations are withdrawn and there is a general advance on 1898 deliveries. Bessemer iron has had a quiet week, with no change in the position of buyers or sellers. The former are still offering $9.50 at valley furnace for deliveries covering the first quarter of the new year and sellers are holding off on the ground that the advancing tendency manifest in nearly all parts of the market, extended to coke, labor and freights, could easily add 50 cents to the cost of a ton of iron, leaving little or no profit on $9.50 business. For delivery this year $9.25 at valley furnace has been done; sellers generally quote $9.35. The well sold condition of the steel mills is more and more evident. Buyers of billets have found a number of Central Western concerns unable to take prompt business and $15 Pittsburg has been paid in late transactions. The strength of the steel market has made producers of Bessemer iron firmer in their ideas and confident that the advance in that product will soon be more pronounced. Forge iron holds the advance of last week. Its scarcity and the activity of rolling mills point to a continued firm market. Plates have been as active as any description of finished materiai. Vessel and bridge work in the East, vessel building on the lakes, and elevated work in the West have brought good contracts to the mills, and capacity is bettere ngaged now than at any time in the year, while prospects are good for further tonnage in the fall months. The wrought pipe market is a strong one, the output of some of the leading producers being at the highest point for a year. Wire rod products are active, wire nails particularly. The early setting in of fall demand, with the curtailment of capacity lately, through strikes and repair shut-downs, have put the base price at $1.40 with some mills, with $1.35 as a minimum. Barb and smooth wire are in somewhat better demand. On the latter $1.10 and $1.15, Cleveland and Pittsburg, are base quotations.

THE CLEVELAND DISTRICT.

The iron ore situation is interesting, both in its present aspects and the possibilities of some negotiations that are pending. The topic of largest import is the effort of the Oliver Mining Co., standing for the Carnegie and Oliver interests, to get control of Gogebic range properties. Gossip is plentiful, but all of fact that can be stated as yet is that the Oliver Mining Co. has an option on a majority of the stock of the Norrie mine. The supposition is, also, in view of recent examinations of the property and negotiations with the Rockefeller interests, which has control, that an option has also been secured on the Tilden, next in size to the Norrie, of Gogebic mines. Whether but one of the properties is desired or both is of course a matter of conjecture. There are considerations which point to the former as the correct supposition. If only the Tilden be taken, it is possible that some modification of the existing arrangement as to the Oliver mine may be a feature of the deal. The minimum required to be taken from the Oliver might be reduced, in view of the duplication of certain characteristics that would be involved in the use of large quantities of the two ores in the same mixture. If the Norrie alone shall be taken, then the Oliver contract may be expected to stand as at present. The significance of this move of the largest Pittsburg producer for control of old-range Bessemer ores is many-sided. Its bearing on the experience of 1897 with Mesabi ores; on the sort of agreement that may be made next year as to old-range Bessemers, and on the prices that shall obtain for the Lake Superior product in the years just ahead—involves questions of vital import to the ore trade. It would appear that with the taking up of the balance of the Norrie output for 1897 by the Pittsburg company, in the purchases of the past week, it has bought nearly 2,000,000 tons of old-range ores this year, its Mesabi output thus constituting about 40 per cent of its total ore requirements. The shipments of ore in August made the heaviest month's record in the history of the business—close to 2,400,000 tons. Estimating one port, the total to September 1 was close to 7,785,000 tons, against 7,104,092 tons in 1896 and 6,672,051 in 1895, to the same date. Wild charters are made at 70 cents, 60 cents and 55 cents for the head of Lake Superior, Marquette and Escanaba, respectively. For September and October 75 cents is offered from Duluth and 80 cents is asked.

Pig Iron. A sale of 12,000 tons and one of 8,000 tons of Bessemer iron were made last week for delivery in the balance of the year at $9.25, Shenango valley furnaces. Offers of $9.50 for the first quarter of 1898 have been made by steel works and refused by furnaces. Meantime the advances in steel have strengthened sellers' views, particularly in view of the fact that current output of finished steel, by two or three important Pittsburg interests is in excess of their production of pig iron. Foundry irons are stronger, but not uniformly so. A considerable tonnage has been sold through local offices in the week, at prices distinctly above the lowest of the year. On No. 2, $9, $9.15 and $9.25, valley, are prices named on recent sales. Forge iron is stronger and $8 to $8.25 is the valley furnace quotation. Charcoal iron has been in some demand for malleable purposes. A Southern Ohio sale of Lake Superior is reported at a price that shaded $12 at Lake Erie port considerably, though

Continued on page 7

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1143 MONADNOCK BLOCK, Sept. 8.

Every item in the list of iron products shows an advancing tendency, and a number have scored higher prices in the past week. Sales continue large, and would be larger were it not that many of the mills and furnaces are becoming well filled with orders, and are not taking any but desirable business, and that which suits them in regard to deliveries, etc. The leading local interest has taken a heavy tonnage in recent weeks, and now has its mills and furnaces well booked until the end of the year, so that it is not in position to take much further large business. Its quotations, therefore, particularly on steel products, are above the general market at present, although other producers are gradually getting on the same basis, or near to it. Last week the largest business in this market was in structural material. Several orders for round lots were taken, and other new business has come up. The largest of this latter was the inquiry of the Santa Fe road for 12,000 tons of material for bridge work, which will probably be placed within the present week. The car works in this territory secured some business last week, orders of 1,000 cars each having been placed by the C. & O. Railway and the Big Four. One or two smaller orders were also placed. The pig iron market is very strong, advances having been made by the Southern furnaces, and on some grades by Northern furnaces. Sales were heavy, and the demand continues large.

PIG IRON.—Business last week was heavy with the local furnaces, and included orders ranging in size from 2,000 tons down. The demand is still large, and further orders will undoubtedly be closed in large quantities in this week. Prices are firm, and are being maintained at the published quotations by the local furnaces. One of them refuses to sell except at an advance of 25 cents a ton over the prices we quote. Southern interests report a good business, also, although not so large as that of the Northern furnaces. Quotations on Southern irons have been advanced in the week, and are now made about as given below. Buying of pig iron is becoming more general every week, and seems likely to continue for some time. Jobbing foundries, which have been the smallest buyers, relatively, for some time past, have increased their purchases, and last week bought considerable iron. The market is widening appreciably, orders coming in from new territory all the time. All classes of foundries report a better business than they had a few weeks ago, and that the outlook is steadily improving. Quotations have been revised as follows:

Lake Sup. Charcoal	$13 00@13 25	South'n Coke No. 3	$ 9 95@10 25
Local Coke Fdy. No. 1	10 50@11 00	Southern No. 1 Soft	10 70@11 00
Local Coke Fdy. No. 2	10 25@10 75	Southern No. 2 Soft	10 45@10 70
Local Coke Fdy. No. 3	10 00@10 50	South'n Silveries	10 60@10 75
Local Scotch Fdy. No. 1	10 50@11 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	10 25@10 75	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 50	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 85@11 10	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	10 20@10 45	Coke Bessemer	11 50@12 00

BARS.—Car works are still large buyers of iron and steel bars, and are likely to continue so for some time. The Big Four and the C. & O. roads bought 1,000 cars each last week from the Pullman works, and other orders, although none of them so large, were placed. Several round lots of bars have been bought, and judging from the inquiries in the hands of the mills, future orders will be good. The market continues very firm, some of the mills quoting quite a little over our figures, and few mills making lower prices. Common iron is quoted at 1.05c to 1.15c, billet stock steel bars at 1.10c to 1.20c, and guaranteed iron at 1.15c to 1.25c.

RAILS AND TRACK SUPPLIES.—The Illinois Steel Co. has a well filled order book, and is not taking business for heavy sections, except in small lots to fill in. Light sections are in good demand, and sales, while not especially large, are very satisfactory. The market continues very firm. Quotations are made: Rails, $19 to $21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—Recent sales by the local mills have filled them up nearly for the balance of the year, and they are not looking for further business at presentprices. Local quotations are consequently a little above the general market. They are made at $16.50 for billets and $23.50 for rods. Buyers seem anxious to contract for material for delivery into next year, but the mills are not willing to consider any offers for delivery beyond the first of the year.

STRUCTURAL MATERIAL.—Last week the contract for the Quincy bridge, amounting to 1,000 tons, was placed with the Union Bridge Works, of this city, the material to be rolled in Pittsburg. The Alley El power house contract, amounting to 600 tons, was let to the Universal Construction Co., of this city. Aside from these orders, general business was very large, and the continued inquiry speaks well for the future. In new business the week has shown a good tonnage. Two new buildings are being projected in Chicago, one to take 1,000 tons, and the other 3,000 tons. The Sante Fe road has come into the market for 12,000 tons of bridge material, which will probably be placed very soon. Other projects are coming up soon, or are expected to. The market is very firm, although no advances are reported. We quote: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Business last week was good, and included some quite large contracts. Prices are firm, but have not been advanced as yet. The local mills are asking higher prices than outside mills, as they are well filled with orders. We continue our quotations: Tank steel, 1.10c to 1.20c; flange steel, 1.20c to 1.25c; fire-box steel, 1.85c to 5c.

SHEETS.—Orders are more frequent, and have been of good tonnage in the past week. Buyers are more willing to make purchases ahead than they have been for some time, but do not find the mills anxious to tie up to long deliveries. Quotations are unchanged at 1.90c to 2c for No. 27 black, and 80 and 10 per cent discount for galvanized.

MERCHANT STEEL.—Dealers report a large business, both from store and in mill orders. Several contracts of good size were taken last week, and further business is confidently expected this week. The market continues very firm. Quotations are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—The market is not very active, as regards sales. There is a good inquiry for nearly all kinds of scrap, but holders are not anxious for business except at higher prices, and buyers do not seem to be willing to pay any advances. Dealers' asking prices for old material are as follows:

Old iron rails, gross	$11 25@$11 50	Axles, net	$13 50@$14 00
Old steel rails, gross	7 @ 7 50	Cast borings, net	2 75
Old wheels, gross	10 00@ 10 25	Wrought turnings, net	4 00@ 4 50
Railroad forge, net	10 50@ 11 00	Axle turnings, net	5 50@ 6 00
Dealer's forge, net	9 00@ 9 50	Mixed steel, gross	6 25
No. 1 mill, net	7 50@ 8 00	Stove plates, net	5 50@ 6 00
Heavy cast, net	7 50@ 7 75	Heavy melting steel gr.	7 00@ 7 50
Malleable cast, net	8 00@ 8 50	Old iron splice b., gr.	11 00@ 11 25

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Sept. 8.

Some few lines of finished, material yet remain, in which the capacity of the mills is not satisfied and in these actual prices have changed but little. In much the larger number of products the advance is actual and apparently permanent. Raw material and intermediate products are holding well to the recent advance, billets, rods, and sheet bars in particular. Prompt steel is about all taken and future deliveries far into next year. An advance of $1 a ton in old iron rails has tightened old material and caused a general refusal to sell.

PIG IRON.—The strong billet situation has effectually held the advanced quotations on Bessemer iron but the week develops no indications of any considerable purchases. Gray forge is fairly active and 1,000 tons sold late in the week netted $8.60 to a Pittsburg furnace. In the valley $8 is asked. Valley quotations on Bessemer for deliveries this year are $9.35 to $9.50. Some iron was bought last week at $9.25, valley furnace. Pittsburg quotations are $9.75 to $9.90. Furnaces persistently refuse to quote any but prohibitory prices on deliveries next year. Foundry irons are slightly stronger. Quotations follow.

Bessemer at valley furnace	$9.35	to	$9.50
Bessemer delivered Pittsburg District	9.75	to	10.00
No. 1 Foundry	10.35	to	10.50
No. 2 Foundry	9.60	to	9.65
No. 3 Foundry	9.35	to	9.50
Gray Forge, Valley	.....		8.00
" " Pittsburg	.....		8 50

BILLETS.—The billet situation is more quiet, but only because mill capacity is being reached and little steel remains unsold for many months ahead. Buyers needing September

and October steel must pay well for it and $15.25 to $15.50 delivered, is demanded of small buyers. But one or two sellers can guarantee early shipment. For future deliveries $15 to $15.25 is asked.

RAILROAD AND TRACK SUPPLIES.—There is heavy inquiry for standard rails and an improving demand for light sections, both new and for relaying. Quotations are as follows: Steel rails, $19 and $20, according to section; iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.15c to 1.20c.

IRON AND STEEL SKELP.—Busy pipe mills, together with the forced inactivity of Wheeling district skelp mills have effectively stimulated the market for skelp. Quotations are made as follows: Grooved iron skelp, 1.07½c to 1.10c; sheared iron skelp, 1.20c to 1.22½c; sheared steel skelp, 1.07½c to 1.10c.

PIPES AND TUBES.—Jobbing houses and merchant pipe dealers generally still defer stocking up and the mills are preparing for the avalanche certain to come when buying begins. So comfortably filled are the latter that there has been so far no temptation to lower the prices agreed upon two weeks ago as follows: Butt weld, galvanized, 50 per cent off; lap weld, galvanized, 55 per cent off; butt weld, black, 57 per cent off; lap weld, black, 67 per cent off. Steel pipe, 6 tens additional; iron, 5 tens and 5 per cent—both quotations being for carload lots. Discounts on boiler tubes are quoted as agreed: two and a half inch, 77½ per cent off; two and two and one-quarter inch, 75 per cent off; one and one-third inch, 70 per cent off; one and a half inch, 65 per cent off.

PLATES.—Special shell, flange and fire-box plates are being held at an advance of from $1 to $2. The advance in Bessemer and open-hearth tank is more nominal and business is not being rejected nor is competition less keen. The expansion in inquiry and demand is unchecked, and the week's record shows an advance, business being particularly heavy in the Central West. Quotations made are as follows: Bessemer tank, 1c to 1.05c; open-hearth tank, 1.05c to 1.10c; shell, 1.10c to 1.15c; flange, 1.15c to 1.20c.

FERRO-MANGANESE.—Domestic ferro-manganese, 80 per cent, is quoted at $45.50 to $46 maker's mill.

STRUCTURAL MATERIAL.—The advanced season for purchases of structural material and the large mill capacity for shapes are delaying better prices. So far the advance is limited to carload lots and future deliveries and the struggle for attractive tonnages is sharp. The large majority of orders now arising are small and on these 1.05c to 1.10c is asked for beams, and 1c to 1.05c for universal plates and angles. On larger business 1c is still a nominal minimum for beams and channels. Bridge work is just now developing some good orders and for these there is lively competition. Conspicuous in the week's business is the Ford and Herrick building, Cleveland, which will use 4,000 tons of Carnegie steel. Deliveries are to begin in April next.

BARS.—Specifications on steel bar contracts are heavier than anticipated earlier in the year and new business is steadily increasing, so that mills are comfortably filled. The labor difficulty at Jones & Laughlins mills is ended but deliveries have been interferred with and some time will be needed to permit new business being received. On transient business 1c is minimum. Bar iron interests are in better condition than for some time and are asking 1c valley, and 1.05c to 1.15c, Pittsburg. The shut-downs in muck bar mills have created a temporary famine and for present wants muck bar is quoted at $18 to $18.50.

SHEETS.—Both black and galvanized sheets are much wanted for September and October deliveries and few mills have material for sale before Jan. 1. The larger gauges are generally wanted, although No. 28 has been so far the most active size. Sales of this gauge at 2.10c are reported but lower prices are available on future deliveries. No. 26 is to be had still at 1.90c and No. 27 is quoted at 2c. Sales of galvanized were made in the week at 80 and 7½ per cent off list.

TIN PLATES.—Tin plate capacity is well sold up for the rest of the year and in many mills to July next. The sales for immediate use are limited both in number and size owing to the scarcity of prompt product. On prompt 100-lb. cokes, sellers are holding for $3.15 to $3.30; futures, $3.

OLD MATERIAL.—As a result of the higher prices in old material there has developed during the week a disinclination to sell. An advance of $1 per ton on old iron rails has been particularly effective and little material is now available at today's prices. A sale of 500 tons of old rails is reported at $12.50 gross. Sales of wrought scrap at $11.25 are reported and of car wheels at $9 gross.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The market for a week has been in an active condition, especially for Southern irons, and the transactions in general have been on a larger scale. Southern irons have advanced from the bottom 50 cents per ton, and all well-informed appreciate that the advanced figures are still conservatively low. The Northern makers are stiffening up their schedules in sympathy with the Southern, and because of the increased demand from all directions. The demand for charcoal irons has been larger than for several months, and prices are firmer, though as yet not appreciably higher. The improved activity in the car works, and agricultural implement factories, stimulates the rolling mills, steel works and malleable foundries, from whom they must in turn draw liberally for materials, and imparts a tone to the general metal market more agreeable and cheering. The market closes strong, with tendency toward higher values in all classes of pig iron. We quote for cash, f. o. b. cars Cincinnati: Southern coke, No. 1 foundry, $9.75 to $10; No. 2, foundry, $9.25 to $9.50; No. 3, foundry, $9 to $9.25; gray forge, $8.75 to $9; mottled, $8.50 to $8.75; No. 1 soft, $9.50 to $9.75; No. 2, $9.25 to $9.50; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson county silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15; Tenneessee car wheel, $13 to $14.

Buffalo. There has been an unquestionable hardening of pig iron prices not alone with the furnaces in this vicinity, but also those tributary to this territory. It is reported that almost all the valley furnaces have recently made good sales and in some cases are asking an advance over prices of ten days ago. Several foundries that but a short time ago believed they had sufficient supplies purchased to cover requirements for some time to come have found it necessary to duplicate their orders. The advance in Southern iron which took place this week has not been felt in this immediate vicinity, as for some time past this metal has been above the local market. The only effect it had was to somewhat increase the tonnage booked by local furnaces. We revise quotations, which are now as below, f. o. b. cars Buffalo: No. 1 foundry, strong, coke iron, Lake Superior ore, $10.50; No. 2, $10; Ohio strong softener, No. 1, $10.75; No. 2, $10.25; Jackson county silvery, No. 1, $14; Southern soft, No. 1, $11.35; No. 2, $10.85; Lake Superior charcoal, $12.50.

Foundrymen's Defense Association.

The committee appointed at the Detroit convention of the American Foundrymen's Association, to get the sentiment of foundrymen and if favorable to formulate a plan on which an association could be organized and successfully conducted, similar in some respects to the Stove Founders' Defense Association, had a meeting recently at the Manufacturers' Club, in Philadelphia. There was the fullest unanimity in the committee in the conviction that such an association is needed and that it could be successfully organized and conducted. The members of the committee have taken it upon themselves to prepare a form of constitution and by-laws that they think will cover all the requirements, and an address has been prepared which will be submitted to a number of the leading foundrymen of the country, who it is expected will be glad to co-operate with the movement. The objects of the association are to prevent strikes and lockouts so far as possible, and when these occur, to secure an amicable adjustment. The experience with the Stove Founders' Defense Association has been that organization among employers is the best guarantee of harmonious relations with the employes' unions.

AT Indianapolis, in the Circuit Court an order was entered Sept. 6 for the sale of the Premier Steel Co. plant on Jan. 15, 1898. The property has been in the hands of a receiver since April, 1893, and has been inoperative. The order of sale was based on a showing of excessive expense of the trust.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

PUBLISHED EVERY THURSDAY BY

THE IRON TRADE REVIEW CO.,

CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET:

G. H GARDNER President. A. I. FINDLEY, Editor.

CHICAGO: 1142 MONADNOCK BLOCK. B. M. GARDNER, Associate Editor and Western Manager.

PITTSBURG: 807 TRADESMEN'S BUILDING. JAMES R. MILLS, JR., Manager.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

SEPTEMBER 9, 1897.

SOME CONSIDERATIONS AS TO PRICES.

Those who lean to the cycle theory as a guide to trade developments will take one or two salient characteristics in a business situation and make them the basis of a prediction as to the course of prices. The similarity of 1879 and 1897 has been pointed out many times in the past eight months, large crops at home and a shortage abroad being the chief common features. In comments on the iron and steel market, the possibility of a repetition of 1895 has also been alluded to, the common characteristic being the evidence of reviving demand after a stretch of well-nigh profitless business and of restrained and timid buying. In all these references to 1895 the hope is expressed that there may be no repetition of the speculative phases of that year, that brought collapse after the rapid upward movement. Yet it seems to be generally recognized that chances of a boom and the inevitable reaction lie in all periods of emergence from shortened consumption and prices unprecedentedly low. It is one of the seeming anomalies of trade that, after months and even years of discouragement, in which sellers practically lose all ability to ask a price that carries a profit, they will pass quickly into conditions that make them thoroughly independent. Then their very attitude enables them to get successive advances. Buyers find in sellers' firmness sure proof that still higher levels are to be reached, and in their anxiety to cover in time, keep pushing the market up on one another, most of the buying, meantime, being anticipatory and precautionary.

The ease with which prices have moved up when the swing is once felt, as illustrated by the record of 1895, is the chief reason for some of the expectations recently expressed. Some other considerations, too, favor the view that the advance may be pronounced:

Iron ore prices to-day are too low to give mining companies a legitimate profit. The peculiar conditions surrounding the business this year, which are too familiar to need rehearsal, have forced such a contest for position and prestige that profits have been left out of the account. It is natural that with a general revival in business the great mining interest should seek to compensate for the hard experiences of recent years. Mining labor, moreover, will not be satisfied to continue on to-day's basis if better times come to industry in general. Lake Superior railroads, that made exceptional ore rates last spring, distinctly announced that the reductions were to be considered as only temporary and made to meet the stress that the developments of last winter put upon the trade. Vessel rates will not go up by agreement, to be sure, but it may be counted on that a considerable fraction of the fleet will remain out of the market another season, until the demand makes a rate that will call into commission many boats that have merely paid expenses this year. And if they are operated it will only be because of a higher level of freights than that of 1897. Blast furnacemen, in addition to higher prices for ore, are led to believe that coke may be somewhat higher, say 15 to 20 per cent; and furnace labor need not be expected to go long on to-day's low basis, if any quickening appears in he market. In 1895 furnace employes anticipated rather than followed the market advances.

In the case of the big steel works, the records of 1897 has been very unsatisfactory as to profits. Last year steel rails alone, limited as the tonnage was, represented $10,000,000 of profits to the mills; for 1897, with all its tonnage, the margin will not be one-fifth as much. And with so much finished steel on the cent-a-pound basis and less, there has been no place to turn for compensation. Enormous fixed charges and the constantly growing percentage that must be counted on for renewals, make it imperative that in addition to the advances paid for raw materials, there must be a fair percentage for the steel manufacturer. The present year has been an exceedingly lean one—more so than is to be inferred from some of the tonnages that have seemed remarkable because of their contrast with immediately preceding years. There has been a tendency, in the midst of the sensational developments of the year, to exaggerate the American steel maker's possibilities of cheapness. With returning prosperity, the steel mills will expect to do business on the live-and-let-live basis, and prices will reflect less ardor for retaliatory warfare and a greater disposition to conduct business as an investment, from which returns are to be expected.

When all the increments due to the causes specified and to others, come to be aggregated, it will be found that a considerable addition must be made to the price at which some products have sold in the lowest level period of 1897.

On the other hand, there are some considerations that will tend to hold the advances within conservative bounds. Capacity has greatly increased, both for the production of pig iron and all forms of finished material, since the unexpected demand of 1895 caught the iron trade napping. These two years have seen good strides in furnace outputs, and remodelings to secure larger tonnage and lower cost have been frequent.

Demand in many lines, on the other hand, will

be a long time growing again to its old-time proportions. Railroad renewals, under the tempting rail prices of last February, have been quite all that financial conditions would permit. For 1898 and the few succeeding years this factor need not be strongly counted on. New railroad building will be a plant of slow growth. The newer fields into which iron and steel have been entering can be much more safely counted on, it would seem, than this that was one time the chief dependence of the steel master.

The practical certainty that outside markets must be depended on to take our surplus is one of the chief guarantees that large advances above to-day's basis will not come. This foreign business is the more desired the more it grows, and the appetite of American manufacturers has only been whetted by the experiences of 1897. It is generally admitted that the conquests so far made can only be followed up and added to by keeping reasonably close to the price basis that made them possible. It may be stimulating to optimism to say, in view of accumulating signs of improvement, that the chase for foreign business will be abandoned on the return of good times at home; but the policy of going into outer markets has been deliberately undertaken, with full knowledge of conditions at home that must assert themselves in spite of temporary bursts of demand, and henceforth it must have its influence on all calculations. It is too great a factor to-day to be lightly disregarded for momentary attractions at home.

With all artificial restraints upon demand removed, and prices left to be settled by the natural demand for material, under the general rehabilitation of all industry, the situation is right for a healthy, conservative advance and on the other hand it is free from conditions that would stimulate a boom, with its inevitable disaster.

THE CLEVELAND DISTRICT.—Continued from Page 3.

this figure is now maintained as minimum. We quote f. o. b., Cleveland:

Bessemer	$9 90@10 15	Valley Scotch No. 1	$10 15@10 65
No. 1 Strong Foundry	10 25@10 65	Valley Scotch No. 2	9 75@10 15
No. 2 Strong Foundry	9 50@10 00	Gray Forge	8 65@ 8 75
No. 3 Foundry	9 25@ 9 40	Lake Superior Charcoal	12 25@12 50

Finished Material.

The higher prices for billets have not been attended with corresponding advances in finished material, though wire rods are firm and wire nails are held at $1.40 base by some mills. It would appear that the billet advances obtain chiefly on small lots, since the 10,000-ton contract for tin-plate bars referred to last week was taken at about $16 delivered at Central Ohio and Western Pennsylvania points. The usual advance over the billet price seems to have been cut in two. In Cleveland, 4,000 tons of steel for the Ford and Herrick 16-story building on the Square was closed the past week, at a figure close to 1c, Cleveland. A 2,000-ton contract with the Globe Iron Co. and one of 2,500 tons with the Cleveland Shipbuilding Co. were also taken. Sheets are firm; plates and shapes in ordinary business are 1.05c Pittsburg, and steel bars are quoted 1c, Pittsburg, by most sellers.

Lake Superior Iron Mines.

The strike of miners at the Palms for an increase to $1.65 as an average for mining, ended in the men returning to work at the old rate. The men were paid off and the property shut down, but the stop continued for but a week.

A new find of Mesabi ore is reported on the east end of the range. The property is just east of the Hale mine at Biwabik and is being developed by Capt. Dan. Cole. A large amount of ore is indicated and it will be worked on the open-pit plan.

The Antoine Ore Co. has let a contract for stripping 20,000 yards of earth from the ore body.

The Colonial Mining Co., J. H. Bartow, of Cleveland, president, and Capt. Harry Roberts, general manager, has secured an option on section 25-58-18 on the Mesabi, located just west of the Adams mine at Eveleth. A shaft will be sunk at once.

The Oliver Mining Co. has been taking some ore this year from the Ohio mine, which is a Consolidated property and adjoins the Lone Jack on the south.

Obituary.

Hon. Thomas R. Morgan, Sr., died suddenly of heart disease in his home at Alliance, O., Monday, Sept. 6. Mr. Morgan's wife has been ill for the past three months and he had just left her bedside when he fell to the floor and expired. He was born in Penydarran, Glamorganshire, Wales, March 31, 1834, and came to the United States in 1865. After working for a number of years as machinist and master mechanic in the Cambria Iron Works, at Johnstown, Pa., the machine shops of the Allegheny Valley Railroad and the Atlas Works, at Pittsburg, he engaged in business for himself in Pittsburg in February, 1868, in the manufacture of steam hammers and other special machinery. In August, 1871, he went to Alliance and built the great works of the Morgan Engineering Co., which have made him famous. Mr. Morgan was a member of the American Institute of Mining Engineers and the American Meterological Society. He was the president of the Alliance Savings Bank and a trustee of Mt. Union College. A number of years ago he built the Morgan Gymnasium at Mt. Union College. He was a republican, and always took an active interest in party work. In 1892 Mr. Morgan was the Republican candidate for Congress from the McKinley district. Dr. George Ikirk, of East Liverpool, was successful. Mr. Morgan subsequently refused a nomination.

William L. Glasgow, president of the St. Charles Car Co. of St. Louis, Mo., died last week in Manitou, Col.

Winfield S. Kennedy died at Gap, Lancaster county, Pa., aged 82 years. Mr. Kennedy was a member of the firm of Park Bros. & Co., Ltd., for 25 years.

Personal.

President C. M. Schwab, Mr. James Gayley and Supt. Morrison, of the Carnegie Steel Co., Ltd., and James H. Reed, president of the Pittsburg, Bessemer & Lake Erie Railroad, are members of a party now visiting the Mesabi properties of the Oliver Mining Co.

Walter Kennedy, a Pittsburg engineer, who went to China last year to represent a syndicate which is building a railroad there, has been made special expert on highways, water ways and railways and government expert on mining.

Thos. C. Carson, special railroad agent, leaves this week for China, where he will remain some months in the interests of the Carnegie Steel Co., Ltd.

President Gates, of the Illinois Steel Co., is thus quoted: "We have about 750,000 tons of material sold as of Sept. 1, as against 230,000 tons sold Sept. 1, 1896, and about 431,000 tons sold Sept. 1, 1895. We have advanced our prices $3 per ton on some products within the last 60 days. Our mills are turning out the largest outputs at the lowest costs in the history of the company. We have 2,000,000 tons of ore on hand and to arrive at low prices, and believe the iron and steel manufacturers will be taxed to their utmost capacity for the next two or three years to fill their orders at considerably higher prices than are ruling to-day."

New Open-Hearth Furnaces at Homestead.

The open-hearth furnaces for which the Carnegie Steel Co., Ltd., has had plans for two years will be constructed at once. The original designs of the company called for 16 furnaces, to be built as an addition to the Homestead Steel Works. Ten of these furnaces will be built at once, some contracts for equipment being already let. The furnaces will be of 40 tons capacity and will furnish metal for the entire Homestead Steel Works, all the product of which will be rolled eventually from open-hearth steel. A new rolling mill will also be constructed. A short distance from the site of the new furnaces there is now being erected a large fitting shop, for girder rails, the manufacture of which will be commenced on an extensive scale early in the coming winter. The 33-inch finishing mill will be remodeled for the manufacture of these rails. All sheet bars will be rolled at the Duquesne Steel Works.

THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on the evening of Wednesday, Sept. 1, with President P. D. Wanner in the chair. Mr. Wanner made a characteristic address reviewing the state of trade from a political standpoint since the last meeting of the association, and prophesying better things for the future now that the tariff question has been settled. Secretary Evans then read the following report of the executive committee:

"This is the first meeting since our summer recess. It is hoped that our members have had an opportunity to leave their shops for a short time to visit the mountains and the sea shore, that they may be prepared to struggle with the anticipated business that is promised us by the newspapers. As a matter of fact, it is a question in our mind as to whether the newspapers have been entirely correct. We acknowledge there is a better feeling existing in the different lines of trade, but it is a question if the foundry trade has been benefited up to this date. If it has been benefited, we would like to know to what extent. Is there a greater demand for castings and has there been any advance in prices? We know of a few foundries that are really very busy, and have sufficient work to run them for several months ahead. But while this is the case, we know of a great many other foundries, composing the greater majority, which have very little, or nothing to do. Therefore it is our purpose tonight to ask those who are present how they have been affected. At our last meeting in June, there seemed to be a better feeling existing than there was in January and February. We now want to know what the summer months have brought forth, and if the improvement is still advancing. The rapid advance in wheat of course has been a great boon to the farmer. This will mean a profit to those who did not sell before the advance, and will encourage them up to the point of buying new machinery to assist in gathering the next crop. It will mean the building of new cars, and locomotives to the railroads, and a great many other interests which in the end will redound to the benefit of the foundry. It seems to us that we see in the distance the silver lining of prosperity in the dark cloud that has covered us for the last two or three years."

Following the reading of this report, a number of gentlemen present were requested to tell their experiences in summer trade. Stanley G. Flagg, representing small gray iron castings; P. D. Wanner, and C. L. Prince, representing cast iron pipe; and W. T. Bate, general castings, announced that prospects at present were encouraging. Thomas Glover and J. S. Sterling, however, could offer nothing particluarly encouraging. Thomas Devlin said that trade had been a bit better during August, but that the first seven months of this year were considerably behind the corresponding period of 1896. Antonio Pessano, vice-president of the George V. Cresson Co., reported a great improvement. Their shops, he said, were full of work, with a prospect of much more to come. Mr. Pessano raised a question for discussion. He wanted to know if anybody present had experimented upon the cost of cupola linings in relation to the melt. By notes taken over a long period, he had found that the production of 620 tons meant the outlay on an average of $26 for fire-brick lining. No one else had any testimony to offer upon the question.

Secretary Evans announced that the check for $50 which the association had contributed to defray the expenses of the recent convention had been returned with thanks. He was pleased to report that the contributors to the convention fund were being paid a fair dividend of the surplus.

Mr. I. Roberts Newkirk, of Wm. Wharton, Jr., & Co., Inc., then read the following paper upon

Welding Rail Joints with Cast Iron.

Cast welding rail joints is not a new idea, either in theory or practice, although it no doubt is to many here and in this city.

Probably many of you have already seen the practical operation we are now carrying on at various parts of the city. The principal claims for this style of joint are: First. A very stiff, rigid joint. Second. The most practical way of increasing the life of partly worn-out rails. Third. A saving in the cost of keeping up a good road bed. Fourth. Electric bonding of rails without any separate copper bonds. The apparatus required for carrying on this work successfully consists of, first, a good cupola with spouts and slag-hole mounted with gimbal joints on a very strongly built wagon that also carries within a closed box an electric motor. This drives a fan, supplying the required blast to the cupola through a pipe, with a flexible connection, this being made necessary by the swinging of the cupola to a perpendicular position, that has to be provided for on account of the unevenness of the street grades.

The charging of the cupola is exactly the same as in ordinary foundry practice, there being no special physical or chemical requirements for the metal, beyond the fact that we have to use a strong mixture of iron and hot enough so that it will thoroughly amalgamate with the seel rails. We use coke entirely as fuel.

Power is supplied from the overhead trolley wire by an insulated wire attached at one end to the motor through the rheostat, at the other to a special flat copper shoe, fastened to a pole which a man standing on the ground raises and hangs on the overhead trolley wire. The return is made through ground connection by wire fastened direct to the rails. A switch and automatic rheostat are used to stop or start the motor at the will of the operator. The shape or form of the mold is made by cast iron chills made in halves, which are set in their correct positions and held by a clamp.

Early in the evening a gang of men start to clean and scrape the rails prior to putting on the iron chills, to do this successfully we find it necessary to use specially built heaters to dry the damp dirt, etc., that sticks closely to the rails and is very hard to remove. After this the rails are scraped and cleaned as bright as possible, this being necessary to make the iron amalgamate thoroughly with the rails.

The rails are then surfaced and also lined up; then a screw clamp is put on, connected at each end by a clamp hooking under each rail. Then a head piece is placed on the rails covering each end and the screw of the clamp is screwed down tight, holding the rails in a properly adjusted position, while the iron is poured in on one side, amalgamating with the steel rails. After a mold is poured and a sufficient time has elapsed for the iron to set, the clamp and chills are removed and the same operation gone through again at another joint. We use an electric grinding machine for grinding the top of the head of the rails to an even surface.

The question of expansion and contraction has been a grave matter to deal with; this has been practically settled in the following way: The joints are generally made in warm weather when the rails are expanded to their extreme limit. At each end of a square, or say about every 400 feet an expansion joint is made, that is, a joint which is not amalgamated with one end of the rails. Some railroad men prefer to have all the joints solid, so when the rails contract in cold weather, some joint, having been weakened by blow holes due to any rusty scale or any other cause, will break. The rails will then spread perhaps as much as two or three inches. The joint should then be broken off and a small piece of new rail set in and then a new joint made or cast on. This has been the experience in Chicago and elsewhere where the rails have extreme heat and cold alternately.

The expansion of the rail above the ground where it is free often has a tendency to buckle the rail sideways. In street rails it is different, owing to the strong paving holding it in place. Therefore there is quite a compression at the ends of the rails, keeping them from expanding to their full limit. Again, owing to a certain amount of friction due to the paving, etc., the rails cannot contract near as much as they would if left above ground. The first winter is generally the hardest test for this style of street railroad construction; but after the above repairs are made generally very little trouble is found.

The amalgamation of the iron and rails together usually gives a greater area of surface to carry the current through than is given by the section of rail itself. In practical experience it is known that the large area of cast iron makes the joint much stronger than the rail and when the tremendous contracting strain has been exerted, the rails have broken and pulled apart at some point between the joints.

The Pennsylvania Railroad is now experimenting with 100-lb. rails and the Lehigh Valley Railroad with 60-lb. rails; and very many street railways use 60-lb. rails, showing a growing

tendency to have fewer joints to wear out and reduce the life of the rails. The constant pounding of the wheels on the joints gradually wears an ordinary fish bar or joint plate down under the head of the rails. This in turn will wear away the under part of the head of the rail and then follows the loose joint. To repair this properly we would have to fit a pair of joint plates to each special joint, which would be a very expensive operation.

We usually place the cupola, drawn by five horses, about one square away from the farthest joint to be poured and carry the iron that comes very hot from the cupola back to the joint. We pour each one in turn up to the cupola and then as much past it as is found feasible. We then stop the motor and take off our feed wire and move the cupola to another position and start to melt as quickly as possible, always trying to avoid chilling the cupola any more than we can help. We have mleted about 6,000 pounds per hour with our present cupola, of the Whiting Foundry & Equipment Co.'s make.

Owing to the small ladles into which the iron is tapped and the rapidity of melting, it keeps two men busy all the time tapping out and a gang constantly charging.

While the cast welded joint certainly seems superior to the fish bar joint, I do not think any actual comparison tests between the two have been recorded, therefore I am not prepared to state the increased length of life of the average run of rails at this time. The present electric traction cars are much heavier than the old style horse cars and wear out the rails much more rapidly and have a greater deteriorating effect on the road bed.

In the discussion which followed the reading of the paper, the question of the amalgamation of the two metals was raised, and Mr. Newkirk said that there was no doubt in his mind that they united. That being the case the copper connectors or bonds for carrying the current from rail to rail were not required.

The contraction and expansion of the rails by changes of temperature was another interesting question, and Mr. Newkirk in response to inquiries stated that in Chicago where the extremes of temperature were greater than here, the contraction would occasionally pull the rails apart at the joint, and in one instance the rail itself had been pulled apart. The first winter generally developes these weak places, and they are repaired by inserting a piece of rail to fill up the gap, and welding it in place. The welding, however, is not continued across the junction of streets, nor at curves and switches. At crossings an expansion joint, or slip joint, is placed which permits considerable movement of the rail longitudinally.

Chief Trautwine, of the City Bureau of Water, asked whether such a joint made a good electrical connection for the passage of the large currents flowing in the tracks, as, if it did not much of the current would escape to the water pipes, to their detriment.

Mr. Newkirk replied that no copper bonds had been supplied to span these joints, and he did not believe there was any necessity for them. He did not know that any electrical tests had been made to show this.

No estimate of the cost of the process in comparison with the fish plate method of joining rails could be given; but Mr. Newkirk said that the greatest number of welds made in one night with a gang of 60 men was 102, which would give an idea of the labor and cost.

The association soon after adjourned to the cafe, where luncheon was served.

THE Perkins Machine Co., of South Boston, Mass., manufacturers of presses and dies, have been running quite full even in the midst of the ordinarily dull summer season. The plant of the company is a thoroughly modern one. In the modeling room a number of improvements in presses are now under way, calculated to add both to the strength and the satisfactory operation of these machines. The new style will shortly be placed upon the market with the confident expectation of the manufacturers that sheet metal workers and manufacturers of novelties will be able, in using them, to turn out work more rapidly and at less cost.

STORAGE warrant pig iron increased from 248,400 tons Aug. 20 to 250,300 tons Aug. 31.

RAPID FURNACE BUILDING.

On May 23 last, a slip and explosion occurred at the Rosena Furnace of the Oliver & Snyder Steel Co., at New Castle, Pa., causing the death of Superintendent Edward D. Reis and so wrecking the stack that it was found necessary to tear down the remnant left standing and make the work of reconstruction complete. Under the direction of Mr. John Reis, superintendent of the Edith Furnace of the same company, plans for rebuilding were drawn up by George W. McClure & Son, the well-known Pittsburg engineers. The steel construction was awarded to the Enterprise Boiler Co., of Youngstown, who sublet the contract for plain material to Park Bros. & Co., Ltd., of Pittsburg.

Much delay was caused by the work of demolishing the standing furnace, which was the more tedious because of the salamander present. Blasting was necessary and one mass so removed and buried weighed over 300 tons.

While the generally approved features of the most modern blast furnace practice have been adopted, a conservative course was taken and due regard was had to possible changes in the future. The height of the stack was increased from 75 to 100

FIG. 1.—SEPT. 3. THE NEW ROSENA FURNACE READY FOR BLAST.

feet, and the new bosh is 20 feet instead of 18 feet, as on the old stack. The hearth diameter is 13 feet. Sixteen tuyeres were used, of four and a half inches diameter. The bosh plates are of copper instead of bronze and are not obstructed in removal by any discharge pipes, as the latter do not pass in front of the plates. The bustle pipe was constructed with special reference to the use of fine ores, and is doubly riveted and calked inside and out. The mantle plate projects 15 inches beyond the outside of the shell.

Explosion safety valves—now in successful operation at the Edith Furnace—are also a feature of the rebuilt Rosena. There are two, one on either side of the stack, which extend 20 feet above the down-comer. An inverted bell closes the top and is balanced by an attached lever and weight. They are six feet in diameter—the same size as the down-comer. A gas seal designed by Mr. Reis is also a feature.

No damage was done to the four stoves by the explosion and for the present at least they will be used. They are of the Massicks & Crooke hot blast type, 18x63 feet, and were originally built by Geo. W. McClure & Son, of Pittsburg. The same engines will be used that have heretofore supplied the blast. The brick work was done by contract. Clearfield and S. Barnes & Co. brick was used and the work was under the supervision of Geo. W. McClure & Son.

The steel plates forming the shell are of unusual size—but four comprising a ring. The bottom course is of three-quarter inch plates and the ten courses above range from three-quarter inch to one-half-inch in thickness.

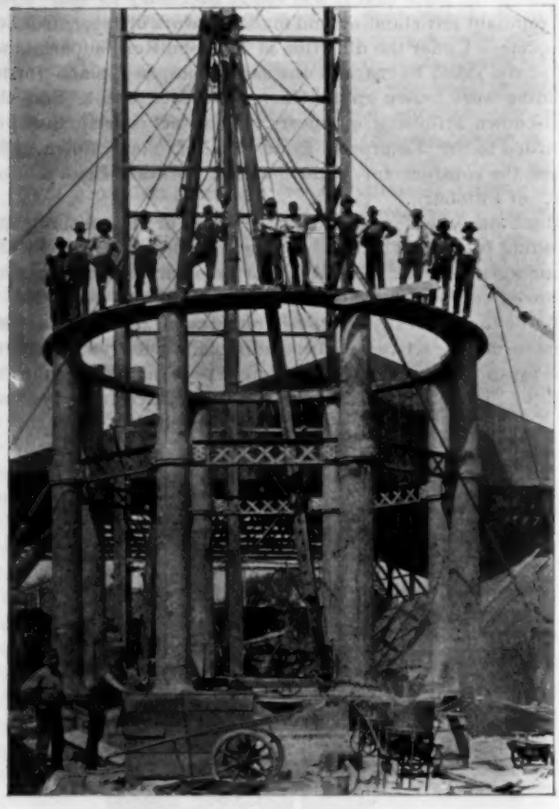


FIG. 2.—JULY 7. CONSTRUCTION WORK BEGUN.

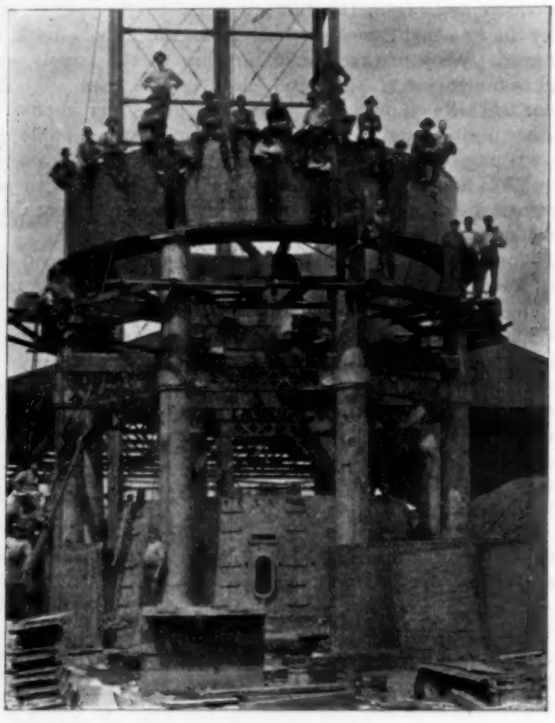


FIG. 3.—JULY 14. THE HEARTH IN PLACE.

FIG. 4.—JULY 23. THE STACK WELL UNDER WAY.

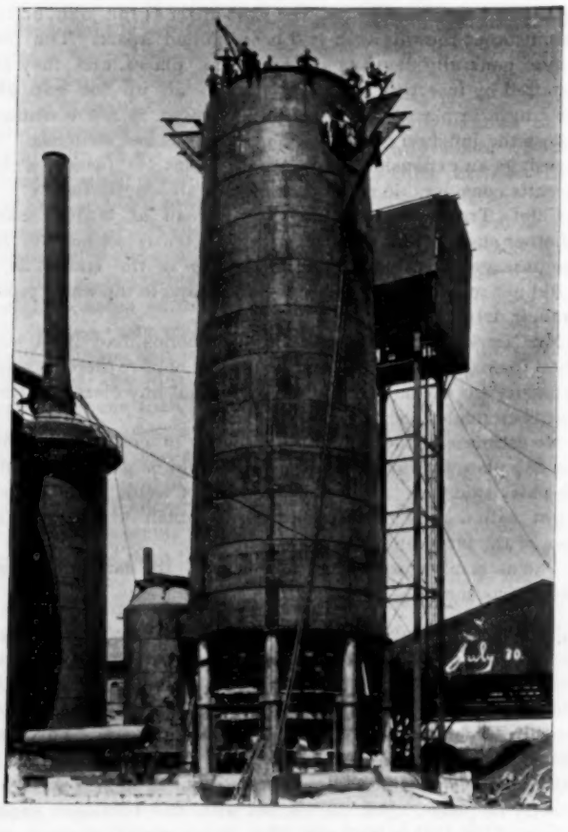


FIG. 5.—JULY 30. TOP CONSTRUCTION BEGUN.

The rapid construction of the stack, however, is the conspicuous feature of the work just completed. This is shown in the accompanying cuts. In view of the fact that during the period of construction rain fell on 23 days the showing is the more creditable. Fires for drying have already been lighted and blast will be turned on probably some time next week.

THE Export Steel Co., having for its object the extension of the foreign trade in hoops, bands, cotton ties, and other steel products, has opened offices in the Lewis Block, Pittsburg. The officers of the company are: Myron C. Wick, of the Union Iron & Steel Co, Youngstown, president; C. A. Painter, of J. Painter & Sons Co., Pittsburg, secretary and F. L. Clark, of Wm. Clark's Son & Co., Pittsburg, treasurer and manager. Six interests are included in the company.

CONDENSED FROM THE TECHNICAL PRESS.

High-Carbon and Special Steels for Rails.—[*Railroad Gazette*, Aug. 27.]—Mr. Chance opens up the discussion of this question by calling all steels above 0.42 carbon high, and rightly states that street railway men can look with more favor upon this class of rails on account of the comparatively easier conditions under which they are used. One point to be noted is the fact that the thin web and large cooling surface of a high girder rail requires it to be hewn through instead of being cut by the chisel in the ordinary way, to prevent it from splitting horizontally in the web. The two principal kinds of steel of a special composition in current use are Hadfield's manganese steel and a Harveyized steel; each of these under proper conditions have twice the life of the ordinary product. Among the interesting notes on these steels the following may be mentioned. Forged 14 per cent manganese steel has an elongation of 50 per cent in 8 inches, with an ultimate strength of 14,000 lbs., which is certainly excellent. Sudden water quenching from white heat has a great toughening and hardening effect, and a manganese steel casting shrinks about five-sixteenths of an inch to the foot, cannot be drilled by ordinary tools, and is best made as little complicated as possible to obtain the best results. Harveyized steel compares very favorably with the above, and nickel steel moderately high in carbon is said to give excellent results in France. The author goes on to discuss the question of high carbon rails in Europe, and quotes Andrews, of England, as condemning the use of carbon above 0.42. Mr. Chance points out with much force that it would seem unfair to condemn high carbon in general for rails because one of them had failed after long-continued service, and at that contained high sulphur and phosphorus. The reviewer would here state that a study of Mr. Stead's and Professor Ledebur's writings on this subject would be of value in this connection, as the causes of failure can partly be laid to physical conditions entirely outside of the carbon question. Indeed, the author comes near to this when he states that in his opinion re-rolling the rail would be of great benefit in restoring it again to its original strength, even after being fatigued. This statement would seem correct if precaution is taken to examine every rail for microscopic flaws in the wearing surface, and scrapping the ones found in this state. The paper continues with numerous specifications for rails under various conditions, to which the interested reader is referred. The various elements entering into the chemical composition of the rail are then discussed. Carbon has a remarkable effect on the tensile strength of the rail, 0.5 steel running 70,000 lbs. per square inch, while 0.8 carbon may run up to 150,00 lbs. Manganese takes care of some of the sulphur, and reduces the red shortness, but makes the rails hard, brittle, of coarser grain, and easier to wear off. When manganese is very high, however, brittleness is decreased, as in manganese steels discussed above. Silica is best kept under 0.15, and sulphur is to be avoided as much as possible. The shape of the rail section is next taken up, and the material is discussed with reference to its ultimate microstructure. The qualities demanded in a good rail and a review of the heat and mechanical treatment form the next topic, a number of practical suggestions being given, among which the following are recorded here: The ingot should be cast in hot molds, and not stripped too quickly; 20 per cent of the ingot top should be discarded. Overheating should not occur, and in reheating the ingot should be left vertical, and no cinder heats allowed. A modified hydraulic system for solidifying the ingot, and a cooling of the head of the rail are recommended. As to tests of ingots, the carbon of each, the manganese of every tenth, and a complete analysis of every fiftieth is advised. A tabulation of present rail practice concludes the paper, which will amply repay a careful study on the part of rail makers as well as steel men in general. M.

Production of Chromium and Tungsten.—[*Dingler's Polytechnisches Journal*, Aug. 6.]—In view of the growing importance of chromium and tungsten in the production of special steels, their commercial preparation is of great importance. Professor Moissan has gone into this subject very thoroughly and, in connection with his researches with the electric furnace, has demonstrated the possibility of manufacturing pure chromium and tungsten in commercial quantities. His latest method is to take a carbon pipe filled with the metallic oxide mixed with carbon, inclining it, and subjecting it to the electric current; the metal, contaminated with carbon, readily flows off as a result of the reaction. Two carbides of chromium have been identified, one of these, $C_3 Cr_2$, was obtained by employing 350 amperes with 70 volts. The chromium carbides are purified by remelting with lime. When perfectly pure, chromium can be filed and polished. A number of details relating to chromium compounds as well as those of tungsten are now discussed and it is stated that chromium melts at a temperature above that of platinum, while tungsten runs still higher. M.

Determination of Hardening and of Carbide Carbons.—[*Ironmonger, 1897, p. 351.*]—Baron Jueptner gives his methods of determining the hardening and the carbide carbons in steel. In view of the growing interest manifested in the study of these two forms of combined carbon, information on the best methods of isolating them is timely. The chemist who desires to familiarize himself with the details, is referred to the proceedings of the spring meeting of the Iron and Steel Institute. The methods are colorimetric and can be carried out quickly. In combination with the microscope and a study of the delicate structural changes of the steel during the hardening and the annealing processes, chemical methods serve as an excellent guide to explain the occurrences actually observed. The pressure of hardening carbon in a steel will, in the eyes of the writer, eventually become a matter of close inquiry on the part of the manufacturer who wants the best annealed steel obtainable, for here the hardening carbon should be conspicuous by its entire absence. M

Experiments in Tensile Testing.—[*Stahl und Eisen*, Aug. 1.]—In making specifications for tensile tests, the elongation is usually required as not less than so many per cent, while the ultimate strength is placed between upper and lower limits; similarly the elastic limit. Mr. O. Knauth brings out this paper with a view of showing that variations in results may not only be due to the various methods of preparing the samples, but also to what could be called the factors of the testing machinery. For the purpose of these tests there were bought from four large steel works sheets of fire-box steel three feet by six, having a thickness of 0.6 inch and under specification of 25 per cent minimum elongation, with an ultimate strength of from 48,600,to 57,100 lbs. per square inch. From the center of these plates nine strips two inches wide and 16 inches long were sheared off side by side, and sent to four well-known testing laboratories while in their rough and warped state. Here they were trued up, some hot, others cold; and then milled out to furnish a section of about 0.64 square inch, with a testing length of eight inches between punch pricks. The results of these tests are now tabulated and shown graphically, and the following conclusions are arrived at: The effect of straightening a test-piece while cold makes the test unreliable, as the ultimate strength goes up, but the elongation suffers. The difference due to the testing machines themselves is about four per cent, omitting the results obtained from the cold-straightened test pieces. Now, as these tests were made at laboratories famous for the accuracy and care given, it would seem, according to the author, that these variations are inherent to the art of testing. The time taken for the tests varied from 5.2 to 13.0 minutes each and is said to play an unimportant part, which seems contrary to American views on this subject, as we hold that the quick-acting hydraulic machines give higher results than the slower screw machines. The article goes on to discuss the evil effects of cold-straightening test-pieces, enumerates the factors to be dealt with in preparing samples generally, and concludes with the statement that, while the German approved custom allows a variation of 8,500 lbs. per square inch in heavier plates, the range of error in testing machines reduces this by 3,000 lbs. either way, leaving a leeway of only 2,500 lbs. per square inch to the benefit of the rolling mill. M.

The Standard Scale & Supply Co., of Pittsburg, has been compelled to increase its force of men at the Bellefonte works and to run the works 13 hours every day. The company has sufficient orders ahead to keep the plant busy for months to come.

FAILURE OF AN UPRIGHT BOILER.

The designing of a boiler appears to be a very simple thing to one who has never tried it; and, indeed, it is a simple thing if efficiency is left out of the question, and the draftsman is allowed to follow some type that is fairly familiar to him. But when the conditions to be met are somewhat out of the ordinary, so that a type unfamiliar to the designer appears to be called for, there is plenty of room to make mistakes

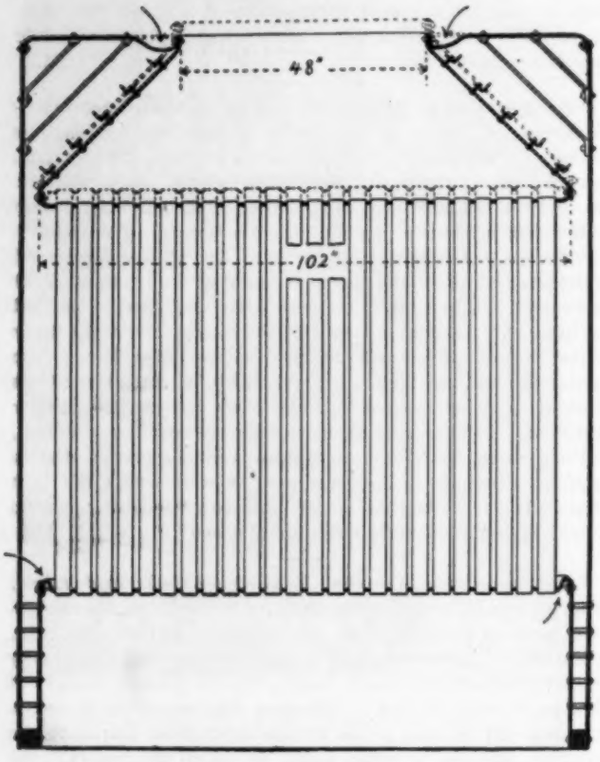


FIG 1.—FAILURE OF A CONE-TOPPED BOILER.

about very simple matters. We see illustrations of this fact every day, and in the present article we propose to describe one such illustration, which appears to us to possess a certain degree of interest.

The boiler in question, which is shown in Fig. 1, was built for use in a 115-foot steamboat, and, in order to insure the stability of the craft, it was made short and of large diameter. Externally it was 9 feet in diameter and 11 feet high, with some 200 vertical tubes, each 6 feet long and 2½ inches in diameter. The upper ends of these tubes opened into a conical smoke-box, which was 32 inches high and 102 inches in diameter at the bottom, with an opening 48 inches in diameter at the top. The sides of this smoke-box were supported, externally, by five rings of angle-iron, as indicated in Fig. 1, and the upper head of the boiler, which was of half-inch steel, was braced to the shell, substantially as shown.

The boiler was intended to carry a regular working pressure of 100 pounds to the square inch, and it was thought best to test it, by hydrostatic pressure, to 150 pounds.

In the course of the test the boiler soon showed signs of weakness, and when the test-pressure reached the regular working pressure of 100 pounds, it was found that the whole mass of the tubes, together with both tube sheets, had gone down fully one inch, the upper head and lower tube-sheet giving way by bending, as shown by the arrows in Fig. 1. Upon continuing the test, the deformation increased, until, when a pressure of 150 pounds was reached, the sheets had taken a permanent deflection, or "set," of something like two inches and a half.

We do not have to look far to find the reason for this behavior of the boiler while under test. It will be easily seen that the downward pressure of the steam against the lower tube-sheet is just equal to the upward pressure against the upper tube sheet; so that the two tube-sheets are balanced against each other, and therefore these parts of the boiler need not be considered in our investigation of the cause of failure. The real difficulty is that there is a resultant downward pressure of the steam against the outside of the cone top. To understand this point, let us refer to the diagram shown in Fig. 2. In this diagram the outer rectangular vessel corresponds to the shell of the actual boiler, and the cylindrical body within represents the combined tubes, tube-sheets, and cone top. In the boiler, the lower tube-sheet and the upper end of the cone are riveted

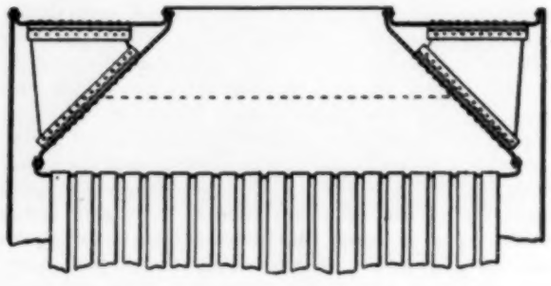
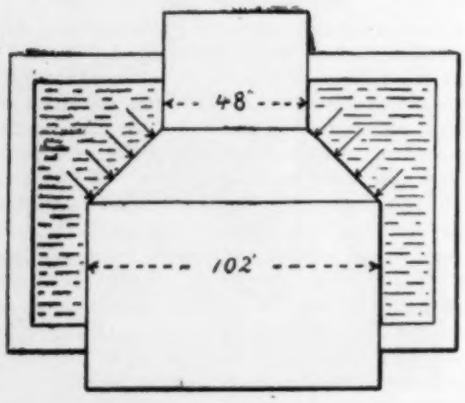


FIG. 4.—PROPER DISPOSITION OF THE GUSSET STRAPS.

to the shell; but in Fig. 2 we have shown the corresponding parts as though they were merely fitted in a frictionless way into water-tight openings in the shell. After considering the problem from this new point of view, we will return to the actual case in which the parts are riveted in place.

The pressure, in Fig. 2, acts perpendicularly to the cone surface, as indicated by the arrows; so that it tends to collapse the cone, and also to force it downwards. We have no pres-



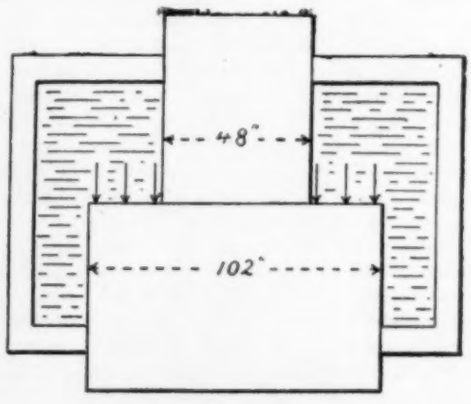


FIG. 2.—UNBALANCED PRESSURE ON THE CONE.—FIG. 3.

ent concern with the collapsing tendency, since this is supposed to be sufficiently resisted by the rings of angle-iron shown in Fig. 1. The downward thrust of the pressure, however, is very important. To get at its amount, we may treat our apparatus as though it were constructed as in Fig. 3; for, although only part of the oblique pressure in Fig. 2 is vertical, while that in Fig. 3 is entirely so, yet the obliquity in Fig. 2 is exactly compensated by the fact that the total surface exposed in Fig. 2 is correspondingly greater than that in Fig. 3.

Now the area exposed to vertical pressure in Fig. 3 consists of a ring which is 102 inches in diameter externally, and 48 inches internally. The area of a 102-inch circle is 8,171 square inches, and the area of a 48-inch circle is 1,810 square inches, and hence the area of the ring in question is

$$8,171 - 1,810 = 6,361 \text{ square inches.}$$

Now, when the test pressure reaches 100 pounds to the square inch, the total downward pressure against this ring is

$$6,361 \times 100 = 636,100 \text{ pounds,}$$

or over 318 tons.

Returning now to Fig. 1, we have learned that when the pressure in the boiler reaches 100 pounds per square inch, the system of tubes, tube-sheets, and cone top, is exposed to a resultant downward pressure of more than 318 tons, and an examination of Fig. 1 will show that this enormous load has nothing to sustain it except the stiffness of the upper head of the boiler and the edges of the lower tube-sheet. These, in the case under consideration, were made of half-inch steel, and they proved to be altogether too weak to support such a stress. They therefore bent and gave way as indicated, until, when the total load reached 477 tons (i.e., 150 lbs per square inch), they had taken a permanent set of two inches and a half.

It is not our purpose, in the present article, to discuss the proper way of designing cone-topped boilers, but merely to point out how easy it is to overlook an important fact in the design of a boiler. Yet we feel that no article can be entirely satisfactory if it simply points out a defect without any suggestion as to how it is to be remedied; and, therefore, we shall venture one or two suggestions in the present case.

The main point is to support the cone top in such a way that the load upon it shall be transferred to some proper place. This can be accomplished in various ways. The upper tube-sheet, for example, could be supported by brackets secured to the side sheets of the boiler; but it would be better and more logical to tie together the two parts of the structure that tend to be forced apart. It is easy to see that the steam pressure tends to force the cone downwards and the upper head upwards; and, therefore, one good way to secure the desired strength would be to connect the cone with the upper head by means of a sufficient number of braces. Gusset stays appear to be well adapted for this purpose and if used they should be put in substantially as indicated in Fig. 4, with double angle iron connections at top and bottom. When gusset stays are used, the stiffening rings shown in Fig. 1 cannot be conveniently put in; so it is better to dispense with them, and to put in the gussets closely enough to prevent the cone from collapsing without the use of the rings. For this purpose the gussets should be put in at such intervals that the space between any two of them shall not exceed eight or ten inches, when measured along the surface of the cone, at the height indicated by the dotted line in Fig. 4. It may be found that when the boiler is of unusually large diameter, the gussets are so far apart, towards the outer edge of the top head, that the sectors into which they divide the head are too large to be secure without more or less additional support. In such cases a brace may be run from the shell to each of these segments to provide the extra staying power that is desired.—[The Locomotive.

A Latin-American Commercial Directory.

The Bureau of American Republics, Washington, D. C., has in preparation a commercial directory of the American republics and the European dependencies in Central and South America and the West Indies. It will be a quarto of over 1,200 pages, 9 by 12 inches, and will embrace the following information: 1. Reliable descriptive, geographical, industrial, commercial and statistical data and map of each country. 2. The addresses and lines of business of the commercial houses in Latin America and the Hawaiian Islands. 3. The names of 5,000 or more representative manufacturers, merchants, shippers and bankers of the United States interested in foreign trade, classified under proper headings. 4. The names of the trade and commercial organizations, associations, and unions of the countries embraced in the International Union of American Republics. 5. Valuable data of transportation companies and trade routes by land and water; railway, telegraph and cable facilities; and particulars as to shipping, port regulations, tariffs and customs laws, patent, trade-mark and copyright laws; and commercial licenses, passports and postal regulations. The above information has been secured from the most reliable sources. Specimen pages will be forwarded to all who apply. The price will be $5.

Experiments with Paint for Metallic Structures.

The Department of Public Works of New York City is about to carry out a test of the preservative qualities of various kinds of paint which should be of the greatest interest to all engineers and builders. The experiments are to be made on a massive steel viaduct which carries 155th street across the elevated tracks of the Manhattan Railway Co. The test is to be carried out in a thoroughly scientific and practical manner, and great care will be taken to shut out any disturbing element which might affect the value of the results. A tight board roof will be built beneath the viaduct to shield it from the smoke of the locomotives. The first operation will be to clean off all the old paint and rust by means of the sand blast, and this will be done until the surface of the metal presents a clean and bright appearance. The paint will be put on within three hours from the time the cleaning is finished. The various manufacturers will be invited to tender bids and provide specimens of their paints, and these samples will be used in painting the structure. The precautions which are being taken will insure that the different varieties of paints will have the same opportunities to show their good qualities, and the results will be watched with close attention by those who are responsible for the erection and preservation of all classes of structural steel and iron work.

Larger Output from Stove Foundries.

The output of stoves and ranges this year has been beyond the average. This was not only the case with the total number but is also true of the individual plants, with but few exceptions. A number of these plants have been running steadily throughout the manufacturing season, while others have had a larger degree of activity than has been their custom in recent years. Taking the situation as a whole, it is found that the labor expended at the stove foundries in 1897 to date has produced larger results than in any year since 1892, a fact in itself that speaks very freely for the judgment of the manufacturers. This is also supplemented by the many new ideas that have been brought out, their number being considerably beyond the average. The buying season has begun at an earlier date than for last year. There were signs of activity in July, while the first of August found an additional number of buyers in the field and the record then made has been increased. A strong feature of the situation is in the larger orders from individual dealers. It is seldom the case where a dealer buys a smaller number of stoves than he did a year ago. On the other hand, many recent sales as reported locally have been for considerably larger amounts than was customary in the past five years at this season, and it is evident that the dealers now realize the necessity for stocking up. Advices received from the retail trade are generally favorable, and the indications are all indicative of a fairly prosperous season.—[Stoves and Hardware Reporter.

Iron Ores of Newfoundland.

In an address on the undeveloped mineral wealth of Newfoundland delivered before the Franklin Institute, Mr. A. E. Outerbridge, Jr., says of the iron ores of that region, considerable shipments of which have been made to Sparrow's Point, Md., for the Maryland Steel Co.: "Iron ores are very plentiful, and a Nova Scotia company has operated for several years quite extensively at Belle-Isle, Conception Bay. The export of iron ore is rapidly growing; the ore is found near the surface, is very economically mined and is loaded on board steamers which run close under the high bluffs and take the ore directly into their holds through chutes. It has been found that the cinder refuse, commonly called 'blue billy,' from the Newfoundland pyrites, after extracting the sulphur in the manufacture of sulphuric acid, is almost entirely free from sulphur and is a valuable by-product, used in the manufacture of steel. It commands a higher price than similar cinder from any other source. The Newfoundland year-book for 1897 shows that the export of iron pyrites has increased from 410 tons in 1887 to 36,496 tons in 1896."

MINNESOTA IRON CO'S MINING METHODS.

We make some extracts below from an article in the September *Engineering Magazine* by Horace V. Winchell, of Minneapolis, on "Soft Ore Mining by the Methods of the Minnesota Iron Co.":

Organized under the laws of Minnesota, Nov. 14, 1882, this company, with a capital of $16,500,000, has so extended its interests and expanded its operations that it is to-day by far the largest producer of iron ore in existence. It also owns and operates about 154 miles of standard-gauge railroad; five ore docks, equipped with 743 pockets of a capacity of 120,900 gross tons of iron ore; and nine steel steamers and five barges with a combined capacity of about 50,000 tons. The railroad is operated by the Duluth & Iron Range Railroad Co., and the vessels by the Minnesota Steamship Co. The seven mines owned by this giant iron ore concern are situated at Ely and Soudan on the Vermilion range, and at Biwabik, Sparta, Eveleth and Virginia on the Mesabi range. The docks, as well as the shops and round-house, of the railroad company are at Two Harbors, on the north shore of Lake Superior, at a distance of from 57 to 86 miles from the mines. The railroad was built from Two Harbors to Soudan (67 miles), and the iron mines were opened at the latter place in 1883 by Charlemagne Tower, of Philadelphia, father of our present minister to Austria. The present company acquired possession about three years later.

The names of the mines owned and operated by the Minnesota Iron Co. are: the Chandler at Ely, the Minnesota at Soudan near Tower, the Canton at Biwabik, the Genoa at Sparta, the Fayal and Auburn near Eveleth, and the Norman at Virginia—all in Saint Louis Co., Minnesota. The Minnesota mines, at Soudan, which were the first iron mines opened in the State, produce a hard and massive hematite ore, which, after being mined, is passed through powerful crushers to reduce it to convenient size; the Chandler mine produces a naturally crushed or granular hard ore; and the Mesabi mines yield soft ores of varying chemical and mechanical qualities.

In the 13 years which have elapsed since the first shipments from the Vermilion range the hard-ore mines at Soudan have produced 5,169,071 gross tons of ore; the Chandler mine has sent out 3,793,007 tons; and the Mesabi mines of the Minnesota Iron Co., the earliest known of which was discovered but five years ago and which have been shipping but three seasons, have produced 1,842,504 tons, making a total tonnage of 10,804,582 gross tons, or more than 12,000,000 net tons of iron ore handled by a concern only 15 years of age. In an age of large enterprises the achievements of this company rank with the greatest.

The first mine to be opened on the Mesabi range by the Minnesota Iron Co. was the Canton near Biwabik. This was in 1892. Since then the Norman, Auburn, Fayal and Genoa mines have been successively purchased and developed. The origin of the Mesabi ore is due to the alteration of a rock called "taconite," and its concentration by the action of atmospheric waters in the oxidation of the iron-bearing mineral, and the removal of the commingled silica. This taconite is believed to have been deposited in the waters of the Taconic or Upper Huronian ocean, largely through the agency of foraminifera and the formation of green sand or glauconite. There is a marked contrast between the ores of the Vermilion and Mesabi ranges. That of the former range is in vertical lenses of hard ore; that of the Mesabi is in almost flat beds of fine grained "soft" ore. Both are high-grade hematite.

The mining problems that have presented themselves on the Mesabi, as distinguished from other soft-ore mines, are those which arise from the flat dip and great area of the deposits, and from the fact that the roof is glacial drift, composed of sand, clay and boulders instead of solid rock. Owing to the variable thickness of the ore and its covering (each ranging from 10 to 200 feet or more) as well as to its varying quality and the irregular shape of the lenses, there have been many more or less novel methods of mining proposed. The removal of the glacial drift which covers the ore or "stripping," by steam shovels, is the common method where the ore body is not too deeply buried, and when it possesses sufficient depth and area to warrant the large initial expenditure. It is now considered advisable to strip where the ore is three times as thick as the covering. About one-half the Mesabi output for 1896 was from open-pit mines, and the percentage will be larger for the present year.

There are two methods of excavating the ore and placing it on the car: (1) the "milling"; (2) the steam shovel method. In the former method shafts are sunk near the boundary of the ore deposit. From these shafts levels are driven at any desired depth into or under the stripped ore. Timbered drifts are then run into the ore from the main levels. From these drifts raises are put up to the surface, and the ore is milled down into them by workmen on top. Tram cars hauled by mules or by men convey the ore from these raises to the shafts, where it is hoisted in skips to the surface. In the steam-shovel method railroad trains are run upon tracts laid on the uncovered ore, and the cars are filled by steam shovels, which load the soft hematite directly from its natural bed.

Of the mines owned by this company on the Mesabi, the Canton, Fayal and Genoa are regular underground mines, while the Norman and Auburn are operated by the stripping and milling process.

The output per man employed is very much greater in the milling system than in any other in which the ore is moved chiefly by manual labor. Thus, while from four to six tons per day for each man employed is a satisfactory output for underground mines, it is nothing unusual for the production at milling mines to average 40 tons per day for all men above and below ground, and twice this amount has been mined for short periods under favorable conditions. The scene at the Auburn mine is quite picturesque. The open pit in which the ore is being milled presents the appearance of some volcanic crater, while the men engaged in shovelling and sliding the ore down into the apparently insatiable holes in the ground look like imps of the devil feeding the internal fires. The white smoke which emerges from the dark ore after a blast completes the illusion. The Auburn is the finest example of a milling mine on the Mesabi, and is well worth visiting.

The Fayal mine is already one of the largest and most completely developed in the Lake Superior region. A producer for only two years, and that mainly of ore taken out in development work, it is a good example of what money and brains can accomplish in a short time on the Mesabi range. Miles of underground levels and drifts, all arranged with a view to maximum output at minimum cost, lead the visitor past millions of tons of ore all ready for mining. Ingenious and labor-saving devices and methods abound on every hand, and the plan of the mine is as nearly perfect as study and experience can make it. The future of such mines as these may certainly be regarded with complacency by their owners.

The Duluth and Iron Range Railroad, under the direction of Mr. J. L. Greatsinger, is as efficiently and systematically operated as the iron mines. A standard-gauge mining railroad is perhaps common enough. But to find one with 154 miles of main line and 60 more of side tracks, laid with 80-pound rails, owning some of the finest rolling-stock ever built, consisting of 58 locomotives (12 of which are 12-wheel locomotives weighing 123 tons each), 2,298 ore cars, 434 box, flat and other freight cars, and 14 passenger and express coaches, is certainly worthy of special comment. These cars and locomotives are kept busy during the season of lake navigation, as will be seen from the following statement of the business done in 1895:

Passenger earnings	$ 69,258.01
Freight earnings	1,488,337.44
Mail earnings	7,218.72
Express earnings	6,000.00
Miscellaneous earnings	5,453.02
Total [$9,592.66 per mile]	$1,576,267.19

The business done in 1896 was considerably in excess of that of 1895, and this season is thus far ahead of any former year.

All ore cars are built with hopper bottoms for dropping the ore into the pockets of the docks. The latter are from 45 to 54 feet above the water, and the ore slides from the pockets through iron chutes into the holds of the vessels. The speed with which vessels are loaded and unloaded is little short of marvelous. Vessels frequently load and depart with a cargo of 3,500 or 4,000 tons within two hours from the time they reach port. One record has been made of 2,350 tons of ore loaded in 45 minutes. From 15,000 to 40,000 tons of ore are handled daily at Two Harbors with a force of men that at first

sight seems totally inadequate. For carrying the ore to Lake Erie ports the Minnesota Iron Co., through its associated corporation, the Minnesota Steamship Co., owns a fleet of nine steel steamers and five barges. The names of these vessels and their carrying capacity in gross tons on a draft of 15½ or 16 feet of water are as follows: Mariska, Manola and Maruba, about 2,500 tons each; Masaba and Marina, about 2,700 tons each; Mariposa and Maritana, 3,400 to 3,500 tons; Maricopa, 4,500 tons. The barges are: Marcia and Malta, each carrying 4,000 tons, and the Martha, Manda and Magna, each carrying 4,500 tons. The combined capacity of the fleet is thus nearly 50,000 tons per trip, or slightly less than a million tons during the season. At the average season rates for the past 10 years ($1.16) this fleet is capable of earning more than a million dollars per annum on eastward-bound freight alone. With deeper water between lakes Superior and Huron the size of the cargoes can be materially increased.

The number of employes of the company in its mining operations alone is about 2,400 at the present time. It varies from 1,200 to 3,000. The miners are chiefly Austrians and Finlanders. The latter are considered the more intelligent. The only strike that the Minnesota Iron Co. has ever had was caused by a difference of opinion over the observance of an optional Roman Catholic holiday. That strike lasted but two and a half days. There has never been any trouble over wages or hours of labor. Possessed of seven magnificent iron mines, and owners of a complete line of transportation to carry its ore to market, this company is to-day able to force its way into the ore market, and hold its share of business against any competitors. It has already, July 1, sold 1,882,000 tons of ore for this year's delivery, and its mines will probably produce a total of 2,200,000 tons. Their producing capacity is not less than three million tons, and the railroad and docks can handle three and a half millions.

Going After the Pig Iron Trade of China and Japan.

For some time past American pig iron has been shipped to Japan and China, but in comparatively small quantities, as the bulk of the business of these two countries has been taken by England. Very little has been known in the United States about the kinds of iron required for the Japanese and Chinese trade, or the methods used in those countries in carrying on the business. To find out the needs of the trade, and also to increase the quantities of American iron used in the Orient, Rogers, Brown & Co. have decided to send out a representative, and have made a happy choice in Irvin McDowell, of Chicago. Mr. McDowell has had a varied experience in the manufacture of iron castings, and has a comprehensive knowledge of the foundry business. He has been connected with various foundries in the Chicago district, and was for two years in charge of the chemical laboratory and metal mixes of the Farrell Foundry & Machine Co., of Ansonia, Conn., where he made a great many difficult castings successfully. Mr. McDowell is a son of Major Malcom McDowell, of Chicago, who is widely known to the trade as the inventor of the McDowell semi-steel process, as a veteran foundryman, and as a writer on foundry subjects.

In the past the business of Rogers, Brown & Co. in pig iron in Japan and China has been conducted through the China & Japan Trading Co., of New York, Shanghai and Yokohama, and Mr. McDowell will go abroad under the auspices of this company as well as in the interest of Rogers, Brown & Co. His mission will be to find out all that is possible regarding the foundry business of the two countries, the methods employed and the mixtures and kinds of irons needed, and to promote in every way the sale of American irons. Mr. McDowell will also represent M. J. Drummond, dealer in water and gas pipe, on this trip. He will leave Chicago this week, and will sail from Vancouver, B. C., on the Empress of China, Sept. 13, for Japan. He expects to remain in that country two months, and to be in China for the same length of time. Although his plans beyond that are rather indefinite, he will probably go from China to Australia on the same mission.

This move of Rogers, Brown & Co. is another indication of their enterprise. While the prime reason for sending Mr. McDowell on this trip is necessarily a selfish one, the results will naturally inure to the benefit of the American iron trade at large, which is to be congratulated upon the fact that the movement is undertaken by a concern so well qualified to carry it to a successful conclusion.

ABRAM S. HEWITT ON IRON TRADE PROSPECTS.

In an address made just before his departure for Europe recently, Hon. Abram S. Hewitt expressed himself confidently and with some eloquence on the prospect opening up before the iron trade of the country. And in this connection may be recalled his prediction of an output of 14,800,000 tons of pig iron in the United States by 1900:

"Of course, a sharp revival of the iron business in America with a decided improvement of prices might check the export trade, but it is a comfort to Americans to know that we can command a large and fairly profitable outlet in the markets of the world. It is likely also that in such remoter markets of Great Britain as Japan and Australia American iron and machinery have gone to stay. As to the improved condition in the iron trade in this country, there are no two opinions. The big crops that are coming along, the confidence that prevails and the ability of good enterprises to command cheap money are influences that stimulate the business of the country. Iron is the barometer to business. It leads the way. It is already feeling the influence and prices on some grades have improved slightly. Production is increasing and consumption is more than keeping pace with the increase. And what joy that fact will carry to the Gogebic miner away out in Tower, beyond the 'zenith city of the unsalted seas,' where the dog sledge is still the usual conveyance through the woods in winter; and to the sailors on the vast lake fleets that take the impatient ore a thousand miles to meet its bride, the coke, in the lower lake ports—fleets that have no counterparts anywhere else in the world; and to the steel makers and the rail makers and the hundred trades that know Vulcan as their god."

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Auburn Foundry & Machine Co., Auburn, Ind., has filed articles of incorporation with the Secretary of State. The capital is $25,000.

Lee, Gin & Machine Co., James Lee, Jr., manager, Memphis, Tenn., is in the market for a bolt-header to head bolts up to and including two-inch; one 50-inch swing lathe to take 16-feet centers; one 24-inch swing lathe to take 12-feet centers; one 18-inch lathe to take 10-feet centers; one 14-inch swing lathe to take 6½-feet centers; one 15-inch crank-shaper.

O. E. Obinsham, Buchanan, Va., inquires prices of iron pipe, both cast and wrought iron pipes for water purposes. Four miles of six-inch pipe will be laid.

The Brown Co., Ltd., of Rochester, N. Y., has been incorporated, to manufacture Brown's boiler compound, a preparation to remove scale and other substances from steam boilers. Capital stock, $5,000, and directors James W. Brown, Charles Johnson and Burton T. Kinsman, of Rochester.

The Oneida Farm Tool Co., of Utica, N. Y., has been organized to manufacture agricultural implements. Capital stock, $25,000; directors, William C. Mason, of Wallingford, Vt.; Edward N. Abbott and John T. Whitmore, of Binghamton; Henry P. Sullivan, of Erie, Pa.; Philetus W. Tuttle, of Geneva, O.; William H. Withington, of Jackson, Mich., and William H. Cowdery, of Ashtabula, O.

New Construction:—

The rebuilding of the burned Anniston (Ala.) Pipe & Foundry Works, at Birmingham, is under consideration, that being the raw material center of Alabama and giving better transportation facilities.

The Philadelphia Gas Improvement Co., of Philadelphia, Penn., is increasing its plant by erecting a new fire-proof pipe shop, constructed entirely of iron. The building has steel frame-work and a corrugated iron covering. The contract for erecting the building has been let to the Berlin Iron Bridge Co., of East Berlin, Conn.

It is reported that the plant of the Latrobe Steel Co. at Melrose Park, Ill., which was recently destroyed by fire, is to be rebuilt.

Adolph Treopte, formerly with the Globe Wire Works, of Milwaukee, is looking for a site at Oshkosh, Wis., to establish

HARRISON SAFETY BOILER WORKS, PHILA., PA. — HARRISON SAFETY BOILER WORKS, PHILA., PA.
HARRISON SAFETY BOILER WORKS, PHILA., PA. — HARRISON SAFETY BOILER WORKS, PHILA., PA.

BOILERS
OIL SEPARATORS
STM. SEPARATORS
FEED-WATER HEATERS

THE IMPROVED WHARTON-HARRISON SAFETY.

THE COCHRANE OIL SEPARATORS.

THE COCHRANE STM. SEPARATORS

THE COCHRANE HEATERS.

HARRISON SAFETY BOILER WORKS, PHILA., PA. — HARRISON SAFETY BOILER WORKS, PHILA., PA.
HARRISON SAFETY BOILER WORKS, PHILA., PA. — HARRISON SAFETY BOILER WORKS, PHILA., PA.

a factory for the manufacture of architectural iron and wire works.

R. R. McMorris, of Booneville, Miss., secured the contract for the erection of the buildings in Sheffield, Ala., to be occupied by the rolling mill and spike factory to be removed from Roanoke, Va., to Sheffield.

The Great Western Railway Co. will build new machine shops in Des Moines, Ia., which will give employment to a large number of men. New rolling stock will be added, and the track ballasted and wooden bridges replaced with iron structures.

The Indianapolis (Ind.) Stove Co. will erect a stove foundry to cost $9,500.

Additions, Enlargements, Removals, Etc.:—

The Lassig Bridge & Iron Works, Chicago, will build a rivet, engine and boiler house, to cost $12,000.

The Steel Tired Wheel Co., Hudson, N. Y., is building additions to its works. The machinery in the works at Cleveland, O. (formerly the Paige Car Wheel Works), will be divided between the shops at Pullman, Ill., and the shops in Hudson, and the factory at Cleveland closed, which will also be the case with the factory at Ramapo, N. J. All the machinery in the latter factory is to be sent to Hudson, which may necessitate a further enlargement.

The S. Freeman & Sons Mfg. Co. has about completed the extensive improvements and additions to its boiler shop at Racine, referred to some time since. A new machine and wood shop has been built, three stories high, 55 feet in width and 175 feet in length; also a new foundry 65x175 feet; a cupola and core room two stories in height, 30x40 feet; mill and casting rooms 40x85 feet, the latter three stories in height. All of these buildings are of brick construction, and modern in every particular. The Freeman company reports business very brisk and all of its shops filled with work.

The Swarts Metal Refining Co., which recently removed to larger quarters at 20 and 22 North Desplaines st., Chicago, is running its own plant in the manufacture of babbitt metal, solder, etc.

Fires and Accidents:—

At Pittsburg, a large fly wheel in Jones & Laughlins' 28th st. mill burst, tearing the entire side out of the mill and doing much damage. A large piece of the wheel smashed an electric crane in another part of the plant.

At Elmira, N. Y., a hot journal on a fan in one of the trade school shops at the reformatory caused a fire with loss of $4,000 on equipment and building.

Fire destroyed the machine shop of Kirkham & Platt, near Cold Springs, N. Y. The fire originated from defective chimney. Loss, $8,000; no insurance.

A large part of the plant of the Kansas City Car & Foundry Co. in Armourdale, Kansas City, Mo., was destroyed by fire, resulting from the bursting of a furnace in the foundry building. The loss is $150,000. The plant is owned by the Armour interests and is insured for $450,000.

At Portsmouth, O., a 40-ton fly-wheel at the Burgess Steel & Iron Works burst by reason of a 4,800-pound ingot stopping a roll. The roof was riddled, beams were cut in two and the mill was set on fire. A shut-down will be necessary until a new fly-wheel can be secured and the damage to building and equipment repaired.

General Industrial Notes:—

The plant of the East Chicago Iron & Steel Co., at Hammond, Ind., which has been in the hands of Receiver A. M. Turner for the past year and a half, will be sold to the highest bidder Sept. 25, under an order of the circuit court issued Sept. 1. The order was made on petition of Max Pam and J. B. Peterson, who represent the holders of a mortgage for $40,000. The company was controlled by J. J. Parkhurst, of Parkhurst & Wilkinson, of Chicago, and others, and the plant has been idle ever since the failure of the company.

The Aurora Tool Works Co., of Aurora, Ind., moved into its new buildings on Wednesday, Aug. 25. In the evening of that day a procession of officers, employees and others formed at the old works and marched through the streets of the city to the new plant, situated on the B. & O. Southwestern. A banquet was served and a number of toasts were responded to, Col. J. P. Coulter, president of the company, acting as toastmaster. The Aurora Tool Works Co. is the outgrowth of an enterprise started at Aurora eight years ago, by Mr. Schumacher, of Cincinnati. Drill presses were the company's specialty. The main building of the new plant is 108x70 feet. There is also a two-story warehouse. Power is furnished by a 40 h. p. gas engine. The company is extending its trade at home and has made a number of important foreign shipments. The directors are J. P. Coulter, John Kleuber, Philip Horr, Thos. Hibbart, A. Bloom, Chas. Howe and A. B. Pattison.

The Brightman Furnace Co., Cleveland, reports the following sales of Brightman stokers for last month: Grant Ball Co., two; Wm. Bailey & Son, two, second order, Cleveland; Milk Creek Distilling Co., Cincinnati, O., one; Gokey & Son, Jamestown, N. Y., two; several for foreign shipment. Riga, France, two; Antwerp, Belgium, four; Russia, two; Japan, two. The company anticipates larger sales during the present month than in the last.

The Allentown (Pa.) Hardware Works failed Sept. 1 on an execution in favor of the Lehigh Valley Trust & Safe Deposit Co. for $16,000 and E. H. Reniger, trustee, for $13,000.

The Cunningham-Jenkins Mfg. Co. will open the Irwin (Pa.) Foundry & Machine Works, and begin manufacturing the Keystone heaters.

At the annual meeting of the Whitman & Barnes Mfg. Co. at Akron, O., Sept. 1, I. C. Alden was chosen president, succeeding Col. A. L. Conger. The other officers chosen are George E. Dana, vice-president; C. E. Sheldon, treasurer; W. W. Cox, assistant-treasurer; James Barnes, secretary; W. H. Gifford, general counsel; F. H. Hiscock, chairman. Excepting James Barnes, the gentlemen named and the following constitute the board of directors: Col. A. L. Conger, George A. Barnes and K. B. Conger. The retirement of Colonel Conger from the presidency is due to ill health.

Excelsior Furnace at Ishpeming, Mich., is working with regularity, 70 tons a day being turned out.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁞ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

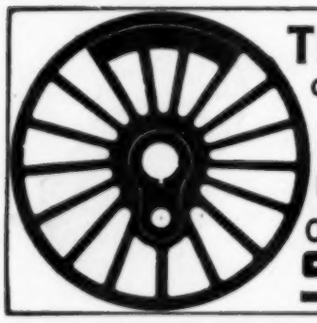
SEMI-STEEL Machinery Castings of All Kinds.

Cylinders, Rolls, Dies, Etc.

Castings Furnished Within Two Days After Receiving Patterns.

40,000 LBS. TENSILE STRENGTH. GIVE US A TRIAL.

SEMI-STEEL CO., KING & ANDREWS CO., Proprietors, Chicago.

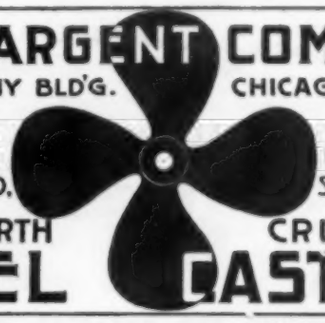


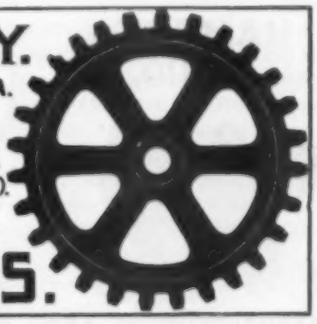
THE SARGENT COMPANY.

OLD COLONY BLD'G. CHICAGO ILL. U.S.A.

ST. PAUL, TACOMA, PORTLAND. ST. LOUIS, CINCINNATI, SAN FRANCISCO.

OPENHEARTH STEEL CRUCIBLE CASTINGS.





OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.

Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

The Youngstown Bridge Co., Youngstown, O., has received several bridge contracts lately, among them one for the 133-ft-bridge at Friendsville, Md., and the contract for the new bridge at Youngstown, the bid on this being $98,560, while other bids ranged from $130,000 to $173,000.

No. 3 furnace of the Pennsylvania Steel Co. is being made ready for blast.

In view of the publication in Pittsburg papers to the effect that a co-operative rolling mill at Hyde Park, Pa., had closed down indefinitely on account of dissatisfaction on the part of some of the stockholders, the management of the Hyde Park Iron & Steel Co. writes that its mill is the only one in the place, but it is not a co-operative mill. The entire plant is being operated, with good prospects of business. There is no dissatisfaction and there is no intention of closing down even for a day.

Fuel scarcity has prevented the starting up of the Union Iron & Steel Co.'s plant at Warren, O., but it was expected operations would begin this week.

A strike among iron carriers at the Spearman Furnace, Sharpsville, Pa., was amicably settled, men being provided to do the work of storing.

Soho Furnace, Pittsburg, is ready to blow in.

Hyde Bros. & Co., of Pittsburg, will furnish Mitchell, Tranter & Co., of Cincinnati, O., a 300 h. p. boiler to be erected in connection with their heating furnaces, at Covington, Ky.

The Toronto Junction (Ont.) Foundry Co. is increasing its capital. It is building another steel furnace, and adding machinery which will about double the present capacity.

The Milwaukee (Wis.) Steel Casting Co., has organized with the following officers: President, L. V. Shaw; vice-president, O. P. Watson; secretary and treasurer, C. N. Bowen. In the open-hearth and crucible furnaces it is prepared to turn out castings of wrought iron, open-hearth steel, crucible steel, Mitis metal, and special tool steel.

The Salem (O.) Wire Nail Co.'s imported men have been sent back to their homes. The company has begun shipping away the rods on hand and announces that the plant will be closed for an indefinite time. The strikers show no signs of acceding to the company's terms.

Among recent sales of the Whiting Foundry Equipment Co.'s cupolas, cranes, ladles, etc., are the following: Ellwood Tin Plate Co., Ellwood City, Pa., traveling crane, 6,000 lbs., with compressed air motor and two air hoists; Lincoln Foundry Co., Pittsburg, one each 15-ton, 10-ton and 5-ton ladles; National Foundry & Pipe Works, Scottdale, Pa., 7-ton spur-geared crane ladle and four special foundry ladles; Car-

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.

MACHINE TOOLS AND SUPPLIES.

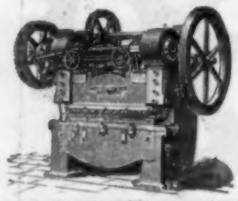
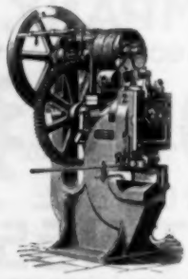
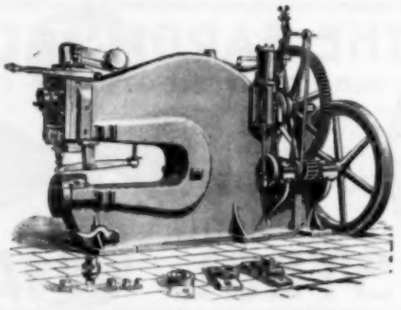
Some SECOND-HAND TOOLS in stock.

1—8-ft. Boring Mill.
1—No. "D" Horizontal Boring & Drilling Machine.
1—Garvin Profiler.
1—A. T. & M. Co. Valve Milling Machine.
4—No. 11 Brown & Sharpe Milling Machines.
2—No. 1½ Stiles Presses.
1—No. 3 Stiles Press.
1—36-in. G. & E. Spur Gear Cutter.
2— Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36-in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—Pratt & Whitney Turret Lathe.
1—109 in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—24-in. x 12-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

EDWARD E. ERIKSON,
CONSULTING AND CONTRACTING ENGINEER.
Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.
Automatic Billet Heating Furnaces. Plans and estimates furnished.
CONESTOGA BLDG., PITTSBURG, PA.

"THE IRON TRADE REVIEW"
is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

THE LONG & ALLSTATTER CO.
HAMILTON, OHIO.

MANUFACTURERS AND EXPORTERS OF **POWER PUNCHING AND SHEARING MACHINERY** ADAPTED TO ALL PURPOSES FOR BOTH HEAVY AND LIGHT WORK.

negie Steel Co., Ltd., two 10-ton spur-geared crane ladles; Robinson-Rea Mfg. Co., Pittsburg, four foundry ladles. The above equipment was placed through Samuel W. Hay, Pittsburg agent, who is also equipping the Derwent Foundry Co., of Ellwood City, Pa., with compressed air hoists and two traveling cranes with air motors for power, five tons capacity.

The Andrews Bros. Co., Youngstown, O., has placed a contract with Julian Kennedy, of Pittsburg, for an additional Kennedy-Cowper hot blast stove, 18x80 feet in size for the Haselton Furnace.

A Milwaukee dispatch says that the Westinghouse Electric & Mfg. Co. has purchased the interests of the Gibbs Electric Co., of Milwaukee. The consideration is reported at $50,000.

The Springfield Machine Tool Co., Springfield, O., has recently put in a large planer, a complete polishing outfit, milling machine and several of its own lathes. The foreign trade of the company has kept up well and is the larger part of its business at present.

At present 3,000 men are employed by the Baldwin Locomotive Works, Philadelphia. There were turned out last year 547 locomotives. The company has just received orders for eight new locomotives for the Chicago, Milwaukee & St. Paul Railroad.

The 85-pound rails that the receivers of the Baltimore & Ohio Railroad Co. purchased several months ago are now being delivered at the rate of 5,000 tons a month. If the weather continues good at least 20,000 tons will be in the track by Christmas.

The Duquesne Tube Co., McKeesport, Pa., has been re-organized and the plant will soon be put in operation. The board of directors consists of W. A. Dunshee, James M. Bailey, H. B. Shields, E. N. Ohln and D. Leet Wilson. The capital stock has been increased to $350,000.

The Burdett-Smith Foundry, Troy, N. Y., which has been idle most of the time for the past two years, will resume operations with a full force.

The Juniata shops, Altoona, Pa., have returned to the 10-hour system, the first time since the panic set in in 1893. The men are working on an order for five extra big freight engines, seven class L passenger engines and 10 moguls.

The Totten & Hogg Iron & Steel Foundry Co., Pittsburg, manufacturer of rolling mill engines, tin plate mills, and rolling mill machinery, have just secured a second order from the La Belle Iron Works, Wheeling, W. Va., for two additional hot mills complete for its new mill; also an order from the Aliquippa Steel Co., for some mills and rolls to enlarge its plant at Aliquippa, Pa.

Locomotive and car building: For the C. & O. the Richmond Locomotive Works will build 12 consolidation engines; the Pittsburg Locomotive Works five for the Chicago & Eastern Illinois; the Brooks Locomotive Works 20, and the Schenectady Locomotive Works 10, for the Imperial Government Railways, of Japan. The St. Louis, Vandalia & Terre Haute is in the market for 500 cars. The Ohio Falls Car Mfg. Co. is buidling 100 cars for the Memphis & Charleston; the Wells & French Co., 500 cars for the Armour Packing Co.; the Mt. Vernon Car Mfg. Co., Louisville & Nashville; the Missouri Car & Foundry Co., 500 cars for the Missouri Pacific (making 1,000 in all); the Ensign Mfg. Co., Huntington, W. Va., 55 cars for Southern roads; the Haskell & Barker Car Co., 1,000 box cars for the C. & N. W.; the Atlanta, Knoxville & Northern, 100 flat cars for itself; the Harlan & Hollingsworth Co., 200 godola cars for the Wilmington & Northern; the Michigan-Peninsula Car Co., Michigan City, Ind., 500 box cars for the Erie Road; the Missouri Car & Foundry Co., 150 box cars for the Kansas City, Pittsburg & Gulf. The above are reported by the *Railroad Gazette*.

The reorganization committee of the Georgia Mining, Mineral & Mfg. Co. will shortly put the Rising Fawn, Ga., blast furnace in operation. The company will also develop its coal and ore property.

The Rudolphi & Krummel Machine Works, Chicago, Ill., has, according to reports, made a large shipment of bicycle manufacturing machinery to England and Germany.

The Westinghouse Electric & Mfg. Co., Pittsburg, Pa., was recently awarded the contract for a power transmission plant for Hawaii. The order includes generators, motors, transformers, etc., for a 150-k. w. two-phase plant.

The Alabama Foundry & Machine Works, New Decatur, Ala., recently incorporated, has a complete plant, which has been in operation for a year, and is said to have cost $85,000. J. B. Harrison is president and treasurer; G. J. Kuehns, vice-president and general manager. Capital stock, $50,000.

Superintendent Cunningham, of the Birmingham (Ala.) Rolling Mills is thus quoted: "The iron business in the South is getting into good condition and the prospects are very bright. Everybody has work down there now. Our plant has been idle for one year and our employees are scattered. We cannot get nearly enough men in Birmingham and had to come north."

At Youngstown, O., Hannah Furnace of the Mahoning Valley Iron Co. will blow in about Sept. 15. Among improvements the company has made in its rolling mill plant the past year is the addition of a new muck mill. The engine was built by Wm. Tod & Co. and the three-high mill by the Lloyd Booth Co. A new seven-inch mill has been put in, manufactured by the Pomeroy (O.) Machine Co. In connection with improvements to the furnace,ore bins have been provided giving about three times the old storage capacity.

The strike of the roughers of the American Iron Works of Jones & Laughlins, Ltd., Pittsburg, has been officially declared off. The meeting taking this action was a stormy one. The firm refused to take all the men back and those who favored standing out will ask the others to resign from the Amalgamated Association. The directors of the Amalgamated Association will be asked to take away the charter of the steel workers' lodge, since the latter refused to join the strike.

The New Castle Wire Nail Co., New Castle, Pa., has signed the rod workers' scale for another year, on the basis of a total of $1.36 per ton, and the disagreement is at an end. The mill will start up with 100 men.

An increase of $125,000 in August in the earnings of the Pullman Palace Car Co., as compared with August, 1896, is regarded as a sign of the times.

Improvement as Seen in the Hardware Trade.

Changes of prices in manufactured hardware have as yet done no more than brace up the unsettled conditions too long their most important feature. The extreme low prices prevailing on heavy hardware are no longer obtainable, having been withdrawn as speedily as the manufacturer—who has seen no dividends for a year or more—is able to realize there is a strong probability of doing again a remunerative business. He does not want his order book filled up with a pile of orders from the prices on which it would puzzle the proverbial Philadelphia lawyer to figure a profit. A number of early orders have already been received from the jobbers direct, by the manufacturers and their commission houses; but the old-fashioned stock orders are still held in abeyance until the present prosperous outlook is confirmed beyond all peradventure. Confidence has been described as a plant of tardy growth, but it is already planted in the rich and fertile soil of "improved conditions," and the full fruition of its growth is not far distant.—[Hardware.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

DOES YOUR ROOF LEAK?

If an old leaky tin, iron or steel roof, paint it with Allen's Anti-Rust Japan. One coat is enough; no skill required; costs little; lasts long.

The name describes it; proof against water, time, climate, and fumes of every description. Stops leaks, and prolongs the life of an old roof.

If you want evidence write us. To be returned at our expense if not satisfactory.

This Anti-Rust is also of highest value in protecting metal pipes, fans, etc., at mines, exposed to the corroding effects of *mine air* and *mine water*.

ALLEN ANTI-RUST MFG. CO.,
413 Vine St., Cincinnati, O.

NON-ARCING AUTOMATIC CIRCUIT BREAKERS

GUARANTEED TO OPERATE PERFECTLY OR NO PAY. MADE FOR ALTERNATING OR DIRECT CURRENT. ANY VOLTAGE. CATALOGUE FREE.

AUTOMATIC CIRCUIT BREAKER COMPANY, NEWAYGO, MICHIGAN, U. S. A.

Graphite Paint.

WORDS OF CAUTION.

When considering the use of a graphite paint as a protective coating for roofs, stacks, boiler fronts, and all other metal work, bear in mind that there are as many different kinds of graphite as there are of iron or steel. Soft graphite is as useless as a paint pigment as soft iron would be for a razor. Ninety per cent of all the graphite that comes to this country is soft Ceylon graphite. Such graphite is specially useful for crucibles, stove polish and many other purposes, but comparatively useless as a paint pigment, **yet it is the kind used** by many manufacturers of graphite paint. Dixon's Silica Graphite Paint has been more or less known for 40 years. It has been on the market 25 to 30 years. Roofs and iron work properly painted have not required repainting in 10 to 15 and even 20 years.

Dixon's Silica Graphite Paint is the graphite paint that has made the great reputation of graphite paints.

The graphite used is the famous Ticonderoga flake graphite known for its great toughness and durability. It is further fortified to withstand the action of sand and dust storms and other wear, by a finely pulverized silica which is mined with the graphite. Dixon's Silica Graphite is an ideal paint pigment and has been demonstrated such by all who have used it. Pamphlets and prices on application.

Joseph Dixon Crucible Co.,

JERSEY CITY, N. J.

LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y
425 Old Colony Bldg., CHICAGO, ILL.

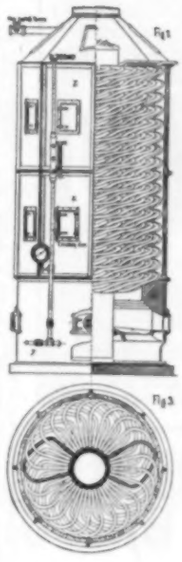
S. FIX SONS'
STEAM TUBE WELDING WORKS.

Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony.

THE CLONBROCK STEAM BOILER CO.,
BROOKLYN, N. Y.



MANUFACTURERS OF—

THE MORRIN "CLIMAX" AND "COMPOUND"
WATER TUBE BOILERS

No Screw Joints. No Metallic Joints. No Ground Joints. No Packing Joints. No Cast Iron Pipes. Manifolds or Headers to cause trouble from Unequal Expansion or Contraction.

Quick and Steady Steamers,
Positive Circulation.

THE "CLIMAX" IS BUILT IN UNITS OF 50 TO 1,000 H. P.
THE "COMPOUND" IS BUILT IN UNITS OF 50 TO 500 H. P.

☞ Caution: Beware of Infringers, they will be rigidly prosecuted.

Specifications, Blue Prints, Etc., Furnished on Application.

SEND FOR "CLIMAX" and "COMPOUND" CATALOGUE

CLEVELAND
.. GALVANIZING ..
WORKS.

Galvanizing in all its branches. Highest prices paid for new Scrap Zinc. When in the market for Pump Chains and Rubber Buckets write us for prices.

CLEVELAND, OHIO.

SUBSCRIBE FOR THE IRON TRADE REVIEW, $3 PER YEAR.

The A B C of Iron.

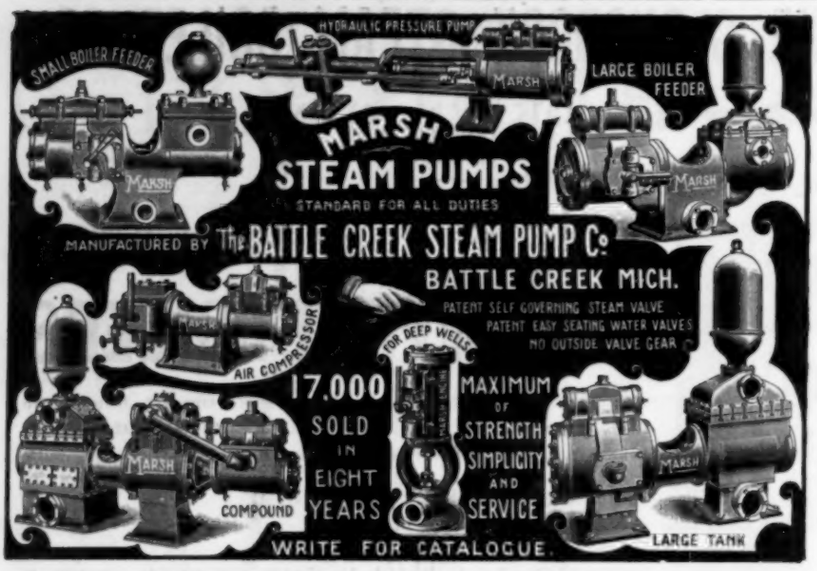
A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

Former Price $2.00, NOW $1.00.

ORDER OF

THE IRON TRADE REVIEW CO.,

27 Vincent St., CLEVELAND, O.



WORTHINGTON STEAM PUMPS

HENRY R. WORTHINGTON,

NEW YORK.

Boston. Philadelphia. Chicago. Cleveland. St. Louis. Indianapolis. Detroit. Atlanta. Pittsburg.

SEND FOR CATALOGUE.

THE 1896 EDITION

OF THE

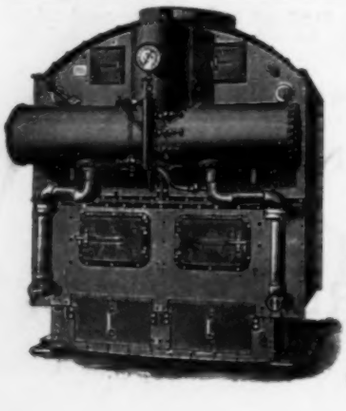
Iron and Steel Directory

Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

The Iron Trade Review

is an increasingly valuable medium through which to sell equipment to machine shop and foundries.



. . . ALMY'S . . .

PATENT SECTIONAL WATER TUBE BOILERS

FOR

Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats, Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive. No priming, and easy to manage.

ALMY WATER TUBE BOILER CO.,

178-184 Allen's Ave., near Rhodes St., PROVIDENCE, R. I.

THE ECONOMIC

Safety Hoist

saves Time and Work, prevents Accidents and is Efficient and Simple. All sizes from ¼ to 15 tons capacity kept in stock, insuring prompt shipments.

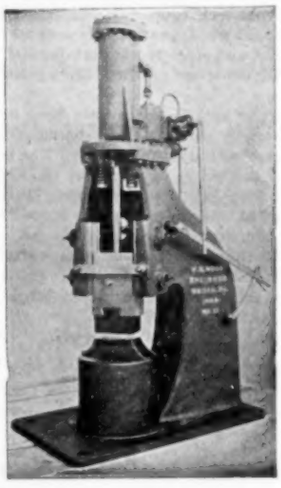
TRAVELING CRANES, Overhead Tracks, etc.

Send for our catalogue with latest discount sheet.

READING CRANE & HOIST WKS.

READING, PA.

STEAM HAMMERS



PATENTED HYDRAULIC MACHINERY. } Riveting Machines, Flanging Presses, Punching, Shearing and Forming Machines

Accumulators, Cranes, Pumps, Etc.

WM. H. WOOD, ENGINEER, MEDIA, PA

Builder of Special Machinery.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME *Daily. †Daily except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

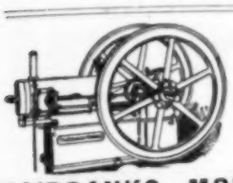
FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:50 am	* 5:30 pm
Akron and Columbus	* 8:50 am	* 5:30 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co.

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:20 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:00 A M	*3:30 P M
Akron, Canton & Chicago	*8:10 A M	*6:35 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:25 P M	†11:00 A

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.



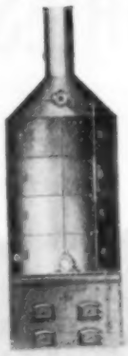
The Fairbanks-Morse Gas and Gasoline Engines possess the same standard of excellence as the **Fairbanks Scales.** We also manufacture **Steam Pumps, Tanks, Wind Mills, Clutch Pulleys,** etc.

Electric Lighting and **Water Works Plants** for factories and residences a specialty.

FAIRBANKS, MORSE & CO., 109 Water St., Cleveland, O.

COMBINATION WASTE-HEAT AND DIRECT-FIRED

High-Pressure Water-Tube Boilers



EQUIPPED WITH

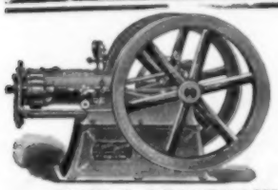
SQUARE FURNACE, SQUARE GRATE SURFACE.
STEEL JACKET, LINED WITH BRICK.
SINGLE BOILERS OR COMPACT BATTERIES.
GREAT SAVING OF FLOOR SPACE AND FUEL.
A HIGH CLASS BOILER WITH AN UNEQUALED RECORD.

CORRESPONDENCE SOLICITED.

THE HAZELTON BOILER CO.,

SOLE PROPRIETORS AND MANUFACTURERS,
Builders of Stacks, Tanks and Miscellaneous Metal Work.

Telephone 1229, 18th St. N. Y. GENERAL OFFICE:
Cable Address, "Palls," N. Y **716 East 13th St., NEW YORK, U. S. A.**



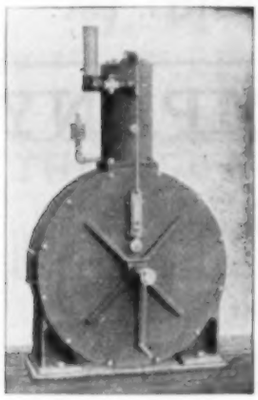
OLDS Gas and Gasoline ENGINE

THE ENGINE that built a 10,000 square ft. addition last year.

BECAUSE { No gears or levers, Simplest carburetor, Wonderful Economy,

KNOW the REQUIREMENTS of a Gas Engine.

OLDS & SON ENGINE WORKS, LANSING, MICH.



THE "BRIGHTON"

GAS AND GASOLINE ENGINES

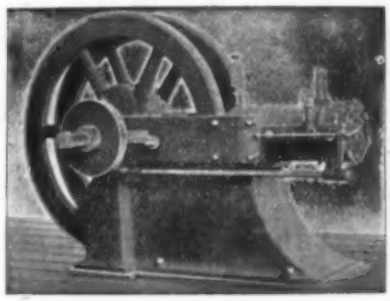
ARE STRICTLY HIGH GRADE.

CLAIMS.

RELIABILITY,
DURABILITY,
SIMPLICITY,
ECONOMY.

Send for Catalogue I

VERTICAL TYPE.—½ to 3½ actual h. p.



HORIZONTAL TYPE.—5 to 50 actual h. p.

Manufactured by

PIERCE-CROUCH ENGINE CO.,

NEW BRIGHTON, PA.

WESTINGHOUSE, CHURCH, KERR & CO.

ENGINEERS.

STEAM ENGINES. STEAM LOOPS.
COMPLETE STEAM PLANTS. COMPLETE ELECTRICAL PLANTS.
REFRIGERATING MACHINERY.
COMPLETE ICE PLANTS.
MECHANICAL STOKERS. MECHANICAL DRAFT.
COMPLETE BOILER PLANTS. COMPLETE ECONOMIZER PLANTS.

NEW YORK	BOSTON.	PITTSBURG.	CHICAGO.
26 Cortlandt Street.	53 State Street.	Westinghouse Bldg.	171 La Salle Street.

The A B C of Iron

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel. Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron.

FORMER PRICE, $2.00

NOW -:- $1.00.

ORDER OF

THE IRON TRADE REVIEW CO.,

27 Vincent St., CLEVELAND.

MICHIGAN COLLEGE OF MINES.
A State Technical School. Practical work. Special facilities for men of age and experience. Elective system. 45 weeks a year. Non resident tuition $150 a year. For catalogue address
Dr. M. E. WADSWORTH, Pres., Houghton, Mich.

THE CENTRAL ELECTROTYPE AND ENGRAVING CO.
263-271 St. Clair St. Cleveland, O.
WOOD ENGRAVING
ELECTROTYPING.

The COAST LINE to MACKINAC

TAKE THE

TO MACKINAC DETROIT PETOSKEY CHICAGO

2 New Steel Passenger Steamers

The Greatest Perfection yet attained in Boat Construction—Luxurious Equipment, Artistic Furnishing, Decoration and Efficient Service, insuring the highest degree of

COMFORT, SPEED AND SAFETY.

FOUR TRIPS PER WEEK BETWEEN

Toledo, Detroit & Mackinac

PETOSKEY, "THE SOO," MARQUETTE, AND DULUTH.

LOW RATES to Picturesque Mackinac and Return, including Meals and Berths. From Cleveland, $18; from Toledo, $15; from Detroit, $13.50.

EVERY EVENING

Between Detroit and Cleveland

Connecting at Cleveland with Earliest Trains for all points East, South and Southwest and at Detroit for all points North and Northwest.

Sunday Trips June, July, August and September Only.

EVERY DAY BETWEEN

Cleveland, Put-in-Bay & Toledo

Send for Illustrated Pamphlet. Address
A. A. SCHANTZ, G. P. A., DETROIT, MICH.

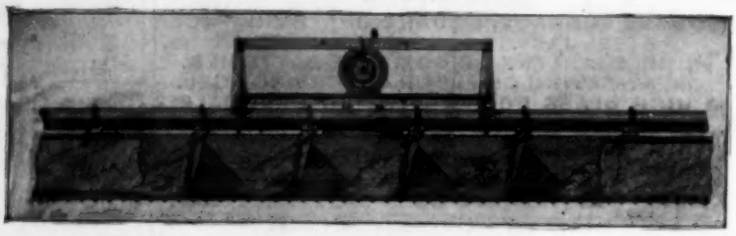
The Detroit and Cleveland Steam Nav. Co

THE BUCYRUS COMPANY,

SOUTH MILWAUKEE, WISCONSIN.

DREDGES, STEAM SHOVELS, EXCAVATING MACHINERY,
STEAM AND ELECTRIC OVERHEAD AND LOCOMOTIVE CRANES,
CENTRIFUGAL PUMPS, WITH SIMPLE, COMPOUND OR TRIPLE EXPANSION ENGINES.
PILE DRIVERS, WRECKING CARS, PLACER MINING MACHINES.

SAND CONVEYORS FOR FOUNDRIES!



CONVEYOR OF WESTINGHOUSE AIR BRAKE CO., WILMERDING, PA.

ELEVATING AND CONVEYING MACHINERY

INSTALLED COMPLETE.

LABOR SAVING DEVICES OF ALL KINDS.

HEYL & PATTERSON

Office No. 108 Market St., -:- PITTSBURG, PA.

LONG DISTANCE TELEPHONE 746.

GENERAL ELECTRIC COMPANY

Electrical Apparatus

FOR THE ECONOMICAL OPERATION OF

Iron and Steel Mills, Engine Shops, Factories of all kinds, Mines, etc.

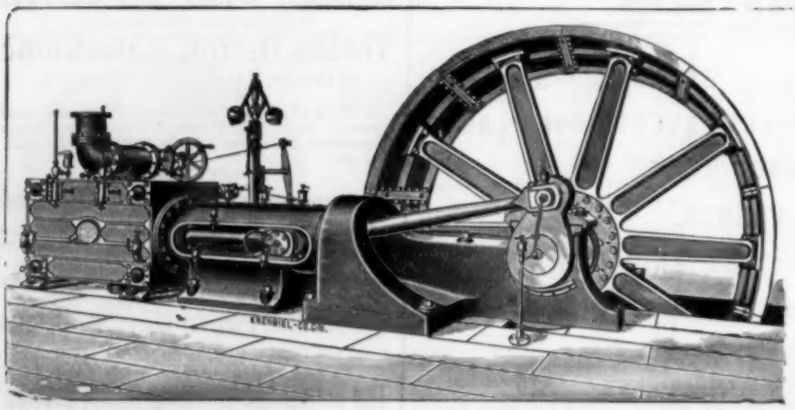
WATER-POWERS UTILIZED.

ESTIMATES AND PRICES ON APPLICATION.

Main Office, SCHENECTADY, N. Y.

Sales Offices in all large Cities in United States. Foreign Department, 44 Broad Street, New York

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



Hamilton Corliss Engines

Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

46 South Canal St., CHICAGO.
39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
Room A, Laclede Building, ST. LOUIS, MO.
C. C. MOORE & CO., SAN FRANCISCO, CAL.

MECHANICAL DRAFT

INDUCED OR FORCED.

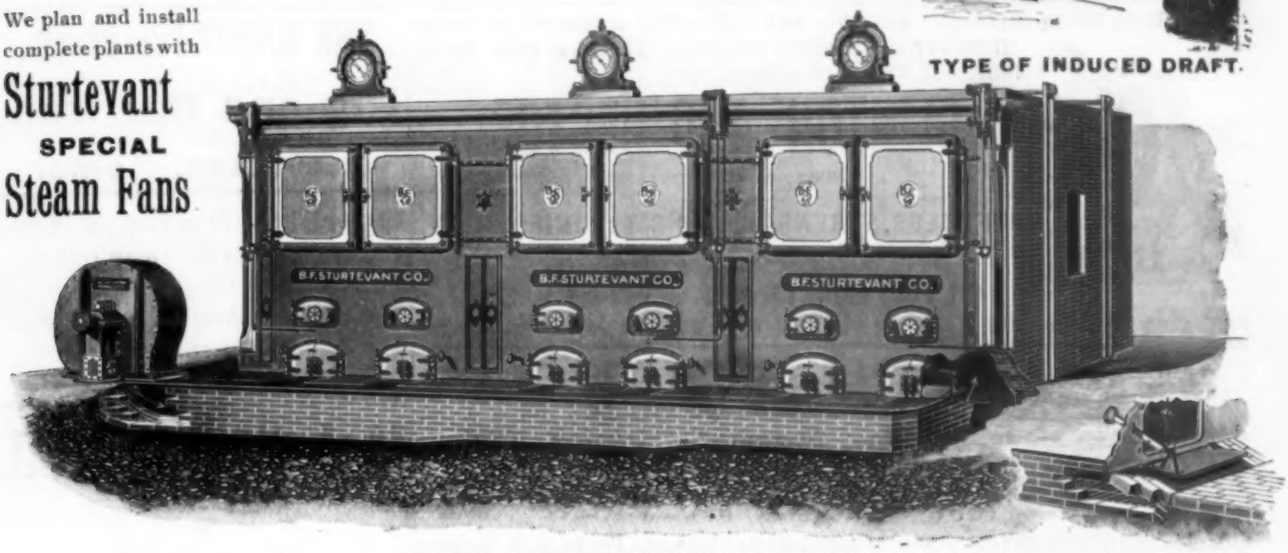
When properly installed and using cheap fuels great saving can be made in Fuel Bills.

Has the advantage of close regulation as well as the greatest variation in draft when called for.

TYPE OF INDUCED DRAFT.

We plan and install complete plants with

Sturtevant SPECIAL Steam Fans



TYPICAL PLANT FOR FORCED DRAFT.

B. F. STURTEVANT CO., Works: BOSTON, MASS.

WAREROOMS: 34 Oliver St., Boston, Mass. | 131 Liberty St., New York, N. Y. | 16 South Canal St., Chicago, Ill. | 135 North Third St., Philadelphia, Pa. | 75 Queen Victoria St., London, E. C., Eng. | 21 W. Nile St., Glasgow, Scotland. | 87 Zimmerstrasse, Berlin, Germany. | 2 Kungsholmstorg, Stockholm, Sweden.

THE 1896 EDITION

OF THE

IRON AND STEEL DIRECTORY

IS NOW READY.

The American Iron and Steel Association has just completed a thorough revision of its

DIRECTORY OF THE IRON AND STEEL WORKS OF THE UNITED STATES,

Bringing down to Jan. 1, 1896, a description of these works. There is also a

COMPLETE DIRECTORY

to other industries which are large consumers of Iron and Steel. A new feature is a complete list of **MALLEABLE IRON WORKS.** There is also a list, brought down to 1896, of Plate and Sheet Mills and of Tin Plate Works in the United States. Making a complete Directory of

BLAST FURNACES,
ROLLING MILLS,
BESSEMER STEEL WORKS,
OPEN-HEARTH STEEL WORKS,
CRUCIBLE STEEL WORKS,
PLATE AND SHEET MILLS,
CUT-NAIL WORKS,
TINPLATE WORKS,
STAMPING WORKS,
FORGES AND BLOOMARIES,
WIRE-ROD AND WIRE MILLS,
WIRE-NAIL WORKS,
IRON AND STEEL BRIDGE-BUILDERS,
IRON AND STEEL SHIP-BUILDERS,
HORSE-NAIL WORKS,
LOCOMOTIVE WORKS,
MALLEABLE IRON WORKS,
CAST-IRON PIPE WORKS,
WROUGHT-IRON AND WROUGHT-STEEL PIPE WORKS,
CAR-AXLE WORKS,
CAR-WHEEL WORKS, AND
CARBUILDERS
IN THE UNITED STATES.

A cloth bound volume of 350 pages, 32 pages more than in the directory of 1894. The price fixed by the American Iron and Steel Association is $6.

The volume can be had at the same price, postage prepaid from

THE IRON TRADE REVIEW,

1142 Monadnock Blk., CHICAGO. | 27 Vincent Street, CLEVELAND.

$2.50 CLEVELAND TO BUFFALO.

ALSO DAILY LINE BETWEEN

Cleveland and Toledo,

Via "C. & B. LINE."

Steamers "City of Buffalo," (new) "State of Ohio" and "State of New York."

DAILY TIME TABLE.

Sunday included May, 30 to October 3.

Lv. Cleveland,	7:00 P. M.	Lv. Buffalo,	7:30 P. M.
Ar. Buffalo,	7:30 A. M.	Ar. Cleveland,	7:30 A. M.

CENTRAL STANDARD TIME.

Take the "C. & B. Line" steamers and enjoy a refreshing night's rest when enroute to **Buffalo, Niagara Falls, Toronto, New York, Boston, Albany, 1,000 Islands,** or any Eastern or Canadian Point.

Cheap Excursions Weekly to Niagara Falls.

Send 4 cents postage for tourist pamphlet.

For further information ask your nearest Coupon Ticket Agent, or address

W. F. HERMAN, Gen'l Pass. Agt. **T. F. NEWMAN,** Gen'l Manager.

Cleveland, O.

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

ÆTNA STANDARD IRON & STEEL CO. BRIDGEPORT, OHIO.

MAKERS OF

BESSEMER PIG IRON,

SOFT STEEL { BLOOMS, BILLETS, SHEET and BLACKPLATE BARS.

SPECIAL SHAPES and MERCHANT BARS.

TIN and TERNE PLATES.

BLACK, PAINTED, GALVANIZED, PLAIN and FORMED SHEETS.

STRIKES THE CENTER

BECAUSE NOTHING BUT THE BEST MATERIAL IS USED "HONESTY IS THE BEST POLICY." TO MAKE GOOD CASTINGS, USE THE BEST IRONS.

CLINTON AND HECTOR

Inspected Foundry Irons

—FOR—

SOFTNESS, STRENGTH, FLUIDITY, UNIFORMITY.

MANUFACTURED BY

CLINTON IRON & STEEL CO.

FURNACES: Pittsburgh, Pa. NEW YORK OFFICE: No. 15 Cortlandt St.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Beams, Bars, Axles, Angles, Channels, Castings, Forgings, Zee Bars, Car-Channels, Locomotive, Car and Structural Steels, etc.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co; Detroit office, Newberry Bldg.; Toledo office, The Nasby, No. 401; Cincinnati office, cor. Elm and Pearl Sts. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,

JOHNSTOWN, PA.

MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.

AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.

LOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Pernot), Hammered Lay, Rolled Lay, etc.

Cold Rolled Steel Shafting. Steel Harrow Discs. Cambria Link Barb Wire.

New York Office, 102 Chambers St. | Philadelphia Office, 611 Phila. Bourse. | Chicago Office, 209 Western Union Bldg. | Atlanta Office, 325 Decatur st.

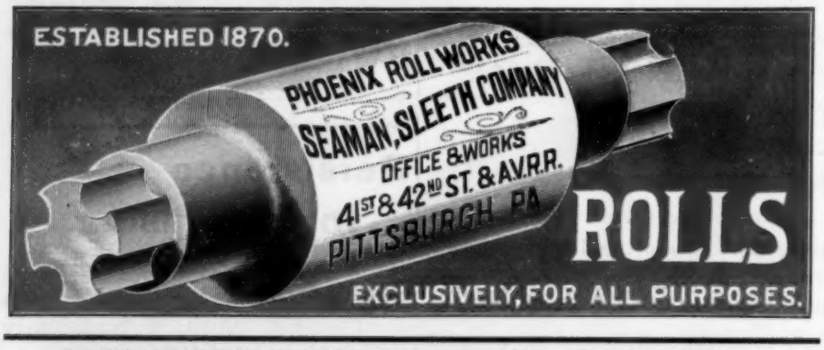
CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.



LAKE SUPERIOR CONSOLIDATED IRON MINES.

HIGH GRADE MISSABE BESSEMER ORES

FROM THE

ADAMS MINE, for sale by TOD, STAMBAUGH & CO., Agts., Cleveland, O.

FROM THE

BURT, HULL and RUST MINES for sale by OGLEBAY, NORTON & CO., Agts., Cleveland O

THE BOURNE-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

LAKE SUPERIOR IRON ORES.

— AGENTS —

The Spanish-American Iron Co., Santiago, Cuba.

CLEVELAND. PHILADELPHIA.

M. A. HANNA & CO.

IRON ORE,

PIG IRON AND COAL.

CLEVELAND, OHIO.

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries, Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc.

Main Office and Works:

48th Street and A. V. Ry., PITTSBURG, PA

Branch Offices:

1123 Betz Building, Philadelphia, Pa.
45 Broadway, New York, N. Y.
228 Lumber Exchange, Minneapolis, Minn.
1243 Marquette Building, Chicago, Ill.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

TILDEN IRON MINING COMPANY,
ASHLAND IRON MINING COMPANY,
AURORA IRON MINING COMPANY,

Iron mines at Bessemer and Ironwood, Gogebic County, Michigan.

CHARLES F. RAND, President,
No. 1 Broadway, NEW YORK, U. S. A.

Spanish-American Iron Company.

Iron Mines near Santiago de Cuba, Island of Cuba.

Annual Capacity 300,000 tons.

Iron Ores for export to all countries.

Cable Address, "Daiquiri," New York. | CHARLES F. RAND, President, No. 1 Broadway, New York, U. S. A.

DIXON'S SILICA GRAPHITE PAINT

FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL. Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

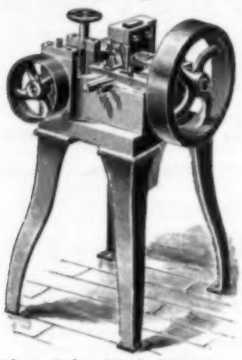
GRANULATED RAW BONE
for
Case-Hardening and coloring.
MANUFACTURED BY
THE ROGERS & HUBBARD CO.
MIDDLETOWN, CONN. P. O. Box 1475.
Our pamphlet "How to Case-Harden," sent free to any address.

THE PITTSBURG TOOL STEEL CO.

Makes by their Damascus Process, HIGH GRADE TOOL STEEL for all purposes—Superior in quality and lower in price than any other. Tensil Strength of Chisel Steel 117,100 lbs. per square inch. Tensil Strength of Lathe Steel 179,600 lbs. per square inch. Guaranteed to hold its Cutting edge longer than any other steel. Send us a trial order and be convinced. **Office, 512 Smithfield St., PITTSBURG, PA.**

This Staple Machine

Makes 300,000 Staples Per Day Directly from the Coil



Shear Point Staple Machine.

and is furnished with tools adjustable in width, also to any length from ¼ to 2½ inches inclusive. Prices $250.00 up. Send for catalogue, price lists, etc., with sample.

JOHN ADT & SON,

F. B. Shuster, Prop.

NEW HAVEN, CONN.

BUILDERS OF

Roll and Rotary Wire-Straighteners, Automatic Wire-Straightening and Cutting Machinery, Riveting Machines, Special Automatic Machinery, Etc.

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Louisiana, and possess

FINE SITES FOR NEW MILLS,

BEST OF FREIGHT FACILITIES,

CLOSE PROXIMITY TO

COAL FIELDS AND DISTRIBUTING CENTERS

AND

INTELLIGENT HELP OF ALL KINDS,

MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns WANTING INDUSTRIES

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North, Western States to the Gulf of Mexico. GEO. C. POWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. 1-2-'98

Hoisting, Crushing and Mining Machinery

EARLE C. BACON.

ENGINEER,

Havemeyer Building, New York.

WORKS.

Farrel Foundry & Machine Co. and Pacific Iron Works.

BACON'S

HOISTING ENGINES

For Every Possible Duty.

MINE CARS, SKIPS and MINE EQUIPMENT.

"FARREL'S" (Blake Pattern)

ORE AND ROCK CRUSHERS

AND

HIGH SPEED OR GEARED CRUSHING ROLLS

COMPLETE HOISTING, CRUSHING AND MINING PLANTS OUR SPECIALTY FOR OVER 20 YEARS, AND IN USE IN ALL PARTS OF THE WORLD.

Send for our Completely Illustrated Catalogues.

Chain Hammer.

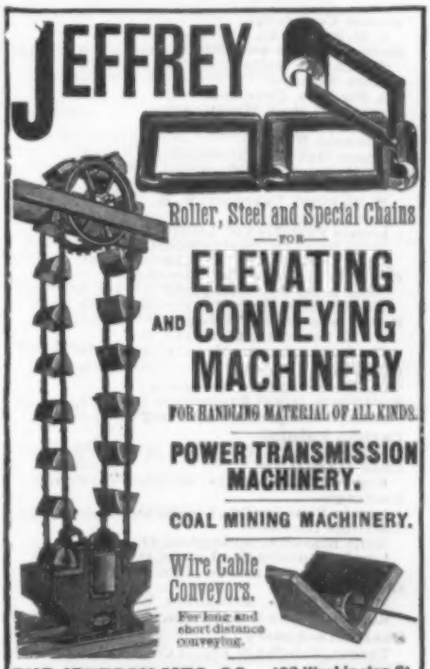
THE TURNER, VAUGHN & TAYLOR CO.

Cuyahoga Falls, Ohio, U. S. A.

MACHINERY

FOR CHAIN AND WIRE FACTORIES.

JEFFREY



Roller, Steel and Special Chains

—FOR—

ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

COAL MINING MACHINERY.

Wire Cable Conveyors.

For long and short distance conveying.

THE JEFFREY MFG. CO. Columbus, Ohio.

163 Washington St. NEW YORK.

Send for Catalogue.

FOR SALE.

HEAVY ROLLING MILL ENGINES.

One 40 x 48 vertical Wetherill-Corliss engine with flywheel. One 28 x 48 blooming mill engine with extra crank shaft and gears. Five Berryman heaters from 500 horse-power to 1500 horse-power.

F. R. DRAVO & CO.

812 Lewis Block. PITTSBURG, PA.

FOR SALE.

Two Morgan Traveling Cranes, each ten tons' capacity, span 45 ft. 6 in. In first-class condition.

THE WESTINGHOUSE MACHINE COMPANY

PITTSBURGH, PA.

FOR SALE.

Five T. H. D. 62-500 volt compound wound generators with self-oiling bearings and complete station instruments, in first-class operating condition. Any one desiring to equip their factory with electrical transmitters of power will find these machines well calculated to serve either as motors or generators, being rated at 85 horse-power. Any one contemplating purchasing electrical machinery will be profited by communicating with us.

STEWART ELECTRICAL CO.,

CINCINNATI, O.

A growing circulation among machine shop and foundry firms, has THE IRON TRADE REVIEW.

FOR RENT.

LARGE MACHINE SHOP,

With power, on Railroad with private tracks. 28,000 sq. ft., more if needed. Electric traveling crane, hoists, shafting, machine foundations and other equipment.

Also other large well-equipped factory spaces, with power, adapted to manufacturers' uses.

THE BRUSH ELECTRIC CO.,

CLEVELAND, OHIO.

W. H. BOSWORTH,

Office, PERRY-PAYNE BUILDING,

Telephone 2451, **CLEVELAND, OHIO.**

Selling Agent for RUSSELL & CO.,

BUILDERS OF

Automatic Engines, Boilers, etc.

Also estimates given on specifications of STEAM and ELECTRICAL PLANTS.

Correspondence Solicited.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Air Compressors—
Rand Drill Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
The Norwalk Iron Works Co., So. Norwalk, Ct.
Clayton Air Compressor Works, New York.

Air Lift Pumps—
Clayton Air Compressor Works, New York.

Aluminum Castings—
Lorain Foundry Co., Lorain, O.

Analytical Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Wm. B. Phillips, Birmingham, Ala.

Annealing Boxes—
Meehan Boiler & Construction Co;, Lowellville, Ohio.
Lorain Foundry Co., Lorain, O.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, N. Y.
Lorain Foundry Co., Lorain, O.
Magnolia Metal Co., New York City.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

Bar Iron and Steel—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Bourne-Fuller Co., Cleveland, O.

Belting—
C. H. Besly & Co., Chicago, Ill.
Schultz Belting Co., St Louis, Mo.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Blowers—
B. F. Sturtevant Co., Boston, Mass.

Blast Furnace Supplies—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Fulton Steam Boiler Wks. & Fdy., Richmond Ind.
The Hazelton Boiler Co., New York.
Clonbrock Steam Boiler Co., Brooklyn, N. Y.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Almy Water Tube Boiler Co., Providence, R. I.
Westinghouse, Church, Kerr & Co., New York City.
Meehan Boiler & Construction Co., Lowellville, Ohio.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
The Lane & Bodley Co., Cincinnati, O.

Boiler Tubes—
S. Fix Sons, Cleveland.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.
W. H. Bosworth, Cleveland, O.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.

Brass Castings—
Lorain Foundry Co., Lorain, O.
Nolte Brass Co., Springfield, O.
The Lunkenheimer Co., Cincinnati, O.

Brass Work (Special Finished)—
Nolte Brass Co., Springfield, O.
The Lunkenheimer Co., Cincinnati, O.

Brass and Iron Fittings—
W. H. Bosworth, Cleveland, O.
The Lunkenheimer Co., Cincinnati, O.

Bridges—
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Shiffler Bridge Co., Pittsburg.

Carbon Points—
Jeffrey Mfg. Co., Columbus, O.

Case Hardening—
Rogers & Hubbard Co., Middletown, Conn.

Castings—
Lorain Foundry Co., Lorain, O.

Castings (Brass)—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.

Chain Hoists—
Moore Mfg. Co., Milwaukee, Wis.
Reading Crane & Hoist Works, Reading, Pa.

Chain Machinery—
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

Chain Belting—
Jeffrey Mfg. Co., Columbus, O.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
Robert W. Hunt & Co., Chicago, Ill.
Wm. B. Phillips, Birmingham, Ala.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Coal and Coke—
W. H Bosworth, Cleveland, O.
Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.

Coal Mining Machinery—
Jeffrey Mfg. Co., Columbus, O.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.

Compressed Air Shop Tools—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
Norwalk Iron Wks. Co., South Norwalk, Conn.

Corrugated Iron—
Sykes Iron & Steel Roofing Co., Niles, O
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Coke and Fire Brick—
W. H. Bosworth, Cleveland, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Edwin Harrington, Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.
Wellman-Seaver Engineering Co., Cleveland, O.
Reading Crane & Hoist Works, Reading, Pa.
Case Mfg. Co., Columbus, O.
The Bucyrus Co., South Milwaukee, Wis.

Dies—
Toledo Machine & Tool Co., Toledo, O.

Double Spindle Lathes—
Dietz, Schumacher & Boye, Cincinnati, O.

Dredges—
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Drill Presses—
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dry Kilns—
B. F. Sturtevant Co., Boston.

Dynamos—
Westinghouse Electric & Mfg. Co., Pitts
General Electric Co., Schenectady, N. Y.
Westinghouse, Church, Kerr & Co., New York City.
Jeffrey Mfg. Co., Columbus, O.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.
Westinghouse, Church, Kerr & Co., New York City.
Card Electric Co., Mansfield, O.
Automatic Circuit Breaker Co., Newaygo, Mich

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Elevating and Conveying Machinery—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Engineers and Contractors—
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Edward E. Erikson, Pittsburg, Pa.
Westinghouse, Church, Kerr & Co., Pittsburg Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, Ohio.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

Engravers and Electrotypers—
Cleveland Electrotype Co., Cleveland, O.
Central Electrotype & Engraving Co., Cleveland, O.

Engines (Gas)—
The Prouty Co., Chicago, Ill.
Charter Gas Engine Co., Sterling, Ill.
Pierce-Crouch Engine Co., New Brighton, Pa.
P. F. Olds & Son, Lansing, Mich.
Fairbanks, Morse & Co., Cleveland, O.

Engine Packing—
C. H. Besly & Co., Chicago, Ill.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Lane & Bodley Co. Cincinnati, O.
Westinghouse, Church, Kerr & Co., New York City.
W. H. Bosworth, Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
B. F. Sturtevant Co., Boston, Mass.
W. H. Bosworth, Cleveland, O.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland.
Stuart Fire Brick Co., Pittsburg, Pa.
Diamond Fire Brick Works, Akron, O.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati

Foundries—
Coshocton Fdy. Co., Coshocton, O.
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
The Ohio Sand Co., Conneaut, O.
Jackson Sand Mining Co., Jackson, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Friction Metal—
Magnolia Metal Co., New York City.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hammers—
Wm. H. Wood, Media, Pa.

Hangers—
Coshocton Fdy. Co., Coshocton, O.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus—
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Case Mfg. Co., Columbus, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Wm. H Wood, Media, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Iron Ore—
Lake Superior Consolidated Iron Mines, New York City, N. Y.
Oglebay, Norton & Co., Cleveland
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Chas. P. Rand. Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia
Dietz, Schumacher & Boye, Cincinnati, O
Wm. Glader, Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.,

PITTSBURG, PA.,

The leading manufacturers of Electrical Apparatus for Electric Lighting, Power Transmission, and Electric Railway Plants.

NEW YORK, 120 Broadway.
BOSTON, Exchange Building.
BUFFALO, No. 1130 Guaranty Building.
CHARLOTTE, N. C., 36-38 College St.
CHICAGO, New York Life Building.
PHILADELPHIA, Girard Building.
PITTSBURG, Westinghouse Building.
ST. LOUIS, American Central Building.
ATLANTA, GA. Equitable Building.
SAN FRANCISCO, Mills Building.
SYRACUSE, N. Y., Bastable Building.
TACOMA, WASH., 102 S. 10thSt.
32 Victoria St., LONDON, S.W., ENGLAND.

WESTINGHOUSE ELECTRIC COMPANY, LTD.

For Canada, address AHEARN & SOPER, OTTAWA, CAN.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Dietz, Schumacher & Boye, Cincinnati, O.
Wm. Glader, Chicago, Ill.

Lubricators—
The Lunkenheimer Co., Cincinnati, O.

Lubricating Boxes—
Coshocton Fdy. Co., Coshocton, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Dietz, Schumacher & Boye, Cincinnati, O.
Wm. Glader, Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
W. H. Bosworth, Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Stamping—
Oliver F. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
The Bucyrus Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.
Card Electric Co., Mansfield, O.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Jackson Sand Mining Co., Jackson, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati. O.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland
Jos. Dixon Crucible Co., Jersey City, N. J.
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill
W. H. Bosworth, Cleveland, O.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Pipe
W. H. Bosworth, Cleveland, O.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Portable Forges—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Power Presses—
Long & Allstattar Co., Hamilton. O.
Perkins Machine Co., Boston, Mass.

Power Transmission Machinery—
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Long & Allstatter Co., Hamilton, O.
Perkins Machine Co., Boston, Mass.

Pressure Reducing Valves—
W. H. Bosworth, Cleveland, O.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

Roofing Paint—
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

Semi-Steel—
The King & Andrews Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City Ind.
Toledo Machine & Tool Co., Toledo, O.
Wm. H. Wood, Media, Pa
Long & Allstatter Co., Hamilton, O.
Perkins Machine Co., Boston, Mass.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Special Machinery—
Toledo Machine & Tool Co., Toledo, O
Edwin Harrington Son & Co., Philadelphia.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Pittsburg Tool Steel Co., Pittsburg, Pa.
Otis Steel Co., Cleveland, O.

Steel Castings—
The Sargent Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O,
The King & Andrews Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tanks—
Enterprise Boiler Co., Youngstown, O
Meehan Boiler & Construction Co., Lowellville, Ohio.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Pittsburg Tool Steel Co., Pittsburg, Pa.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

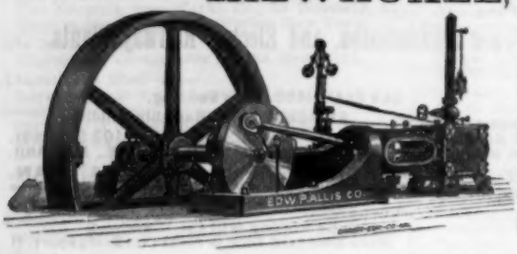
Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Wire Machinery—
John Adt & Son New Haven Conn.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.
Wm. Glader, Chicago, Ill.

Wire Nail Machinery—
Wm. Glader, Chicago, Ill.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF
ICE and REFRIGERATING MACHINERY, Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills. Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

The A B C of Iron.—A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron. CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to Reduce Cost of Mixture. Steel. Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron. Former price $2.00, NOW $1.00. Order of *The Iron Trade Review Co.*, 27 Vincent St., Cleveland, O.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt & Son, John	27
Ætna-Standard Iron & Steel Co	26
Aitchison, Rob't Perforated Metal Co	31
Allen Anti-Rust Mfg. Co	19
Allis & Co., Edward P	30
Almy Water Tube Boiler Co	22
Apollo Iron & Steel Co	1
Automatic Circuit Breaker Co	19
Bacon, Earle C	27
Baird Machinery Co	18
Battle Creek Steam Pump Co	22
Besly & Co., C. H	36
Bethlehem Iron Co	35
*Berger Mfg. Co	21
*Bertsch & Co	—
Bickford, H	36
Bosworth W. H	27
Bourne-Fuller Co	26
Brightman Furnace Co	33
*Brown, Edward	—
Bucyrus Steam Shovel & Dredge Co	24
Cahall Sales Department	1
Cambria Iron Co	26
Card Electric Co	35
Case Mfg. Co	1
Central Electrotype & Engraving Co	23
Charter Gas Engine Co	36
Chicago & Northwestern Ry	33
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clay Co., Oliver P	1
Clearfield Fire Brick Co	35
Cleveland & Buffalo Transit Co	25
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Co	25
*Cleveland Galvanizing Works	21
Cleveland Rolling Mill Co	26
Clinton Iron & Steel Co	26
*Clonbrock Steam Boiler Co	21
*C. M. & St. P. Ry	21
Cole, J. Wendell	36
*Coshocton Foundry Co	—
Crane & Co., B. P	35
Detroit & Cleveland Steam Navigation Co	23
*Diamond Fire Brick Works	—
Dickman & MacKenzie	1
*Dietz, Schumacher & Boye	—
Dixon, Jos. Crucible Co	20-27
Dover Fire Brick Co	35
Drake, Bates & Co	26
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	18
Fairbanks, Morse & Co	23
*Fix Sons	21
Fleharty, J. H. & Co	2
Forster, Waterbury & Co	1
†Fulton Steam Boiler Wks. & Fdy. Co	—
Gates Iron Works	2
General Electric Co	24
Gerlach, Peter & Co	35
Glader, Wm	2
Gobeille Pattern Co	31
Hanna & Co., M. A	26
Harrington & King Perforating Co	36
Harrington, Son & Co., Edwin	36
Harrison Safety Boiler Works	16
Hartford Steam Boiler Insp. & Ins. Co	35
Hazelton Boiler Co	23
Heyl & Patterson	24
Hooven, Owens & Rentschler Co	24
Hunt & Co., Robert W	2
Illinois Central R. R	27
Iron Clad Paint Co	31
Jeffrey Mfg. Co	27
Jenkins Bros	31
Jones Foundry Co., W. A	1
Jackson Sand Mining Co	31
King & Andrews Co	17
Lane & Bodley	32
Lake Superior Consolidated Iron Mines	26
Link-Belt Machinery Co	33
Lloyd Booth Co	34
*Lodge & Shipley Machine Tool Co	36
Long & Allstatter Co	18
Lorain Foundry Co	1
Lunkenheimer Co., The	34
Magnolia Metal Co	1
Marine Iron Works	19
Marion Steam Shovel Co	35
Meehan Boiler & Construction Co	36
Moore Mfg. Co	1
Nolte Brass Co	2
North American Metaline Co	36
Norwalk Iron Works Co	2
Nuttall Co. The R. D	32
Oglebay, Norton & Co	26
†Ohio Sand Co	—
Olds & Son	23
Otis Steel Co	17
Perkins Machine Co	35
Phillips Testing Laboratory, The	34
Pickands, Brown & Co	2
Pierce-Crouch Engine Co	23
Pittman, C. K	2
Pittsburg Tool Steel Co	27
Pollock, Wm. B. & Co	2
Playford Stoker Co	34
Prouty Co., The	2
Rand Drill Co	2
Rand, Chas. F., Prest	26
Reading Crane & Hoist Works	22
Reese, Hammond & Co	36
Rockwell & Co., W. S	33
Rogers & Hubbard Co	27
Sargent Co., The	17
Seaman, Sleeth Co	26
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	26
Shultz Belting Co	1
Stilwell-Bierce & Smith-Vaile Co	2
Stuart Fire Brick Co	33
Sturtevant Co., B. F	1-25
Sykes Iron Roofing Co	34
Textor, O	2
Tod, Wm. & Co	34
Toledo Machine & Tool Co	35
Turner, Vaughn & Taylor Co	27
Union Mining Co	17
Upson Nut Co	1
Westinghouse Electric & Mfg. Co	29
Westinghouse, Church, Kerr & Co	23
Westinghouse Machine Co	27
Wood, Wm. H	22
Worthington, Henry R	22
Wellman Seaver Engineering Co	36

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3.45
No. 1 Specular, Bessemer	3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.90
Hematites No. 1 non-Bessemer	2.00@ 2.25
No 1. Specular, non-Bessemer	2.40@ 2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 90@ 10 15
No. 1 Strong Foundry	10 25@ 10 65
No. 2 Strong Foundry	9 50@ 10 00
No. 1 Gray Forge, red short	8 65
No. 2 Gray Forge, neutral	8 75
No. 1 American Scotch	10 40
No. 2 American Scotch	10 15
Lake Superior Charcoal	12 75@ 13 00
PITTSBURG:	
No. 1 Foundry	$10 35@ 10 50
No. 2 Foundry	9 60@ 9 65
Gray Forge	8 25@ 8 75
White and Mottled	8 50
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	17 00
Bessemer	9 75@ 10 00
CHICAGO:	
Lake Superior Charcoal	$13 00@$13 25
Local Coke Foundry No. 1	10 25@ 11 00
Local Coke Foundry No. 2	10 25@ 10 75
Local Coke Foundry No. 3	10 00@ 10 50
Local Scotch Foundry No. 1	10 50@ 11 00
Local Scotch Foundry No. 2	10 25@ 10 75
Local Scotch Foundry No. 3	10 00@ 10 50
Southern Coke No. 1	10 85@ 11 10
Southern Coke No. 2	10 20@ 10 45
Southern Coke No. 3	9 95@ 10 25
Southern No. 1 Soft	10 70@ 11 00
Southern No. 2 Soft	10 45@ 10 70
Southern Silveries	10 60@ 10 75
Jackson Co. Silveries	12 50@ 14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 75@ 10 00
Southern Coke No. 2 and No. 1 Soft	9 25@ 9 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 25@ 8 50
" " Mottled	8 25@ 8 50
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 00@ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	10 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 00
Ohio Strong Softener No. 1	10 75
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	15 50
Southern Soft No. 1	11 35
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$12 00
Old steel rails (6 ft. and over)	10 00
Old steel rails (6 ft. and under)	9 00
Old car wheels	9 25
	NET TONS
No. 1 R. R. wrought scrap	$ 9 75
Mill scrap	7 25
No. 1 Machine cast scrap	8 00
Iron axles	13 25
Axle turnings	7 50
Wrought turnings (free from cast)	5 50
Cast borings	4 50
Uncut wrought iron boilers	3 50
Steel boiler plates	7 00
Grate bars	5 25
Pipes and flues (clean)	6 50
Tank iron	7 00
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 25
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.05c
Tees	1.15c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.00 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
6¼ to 6½	2.30 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

..'96 JENKINS '96..

Is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does not Rot, Burn or Blow Out, therefore the best for all purposes. Call for and insist on having '96 JENKINS '96 stamped like cut.

Jenkins Bros., New York, Boston, Philadelphia Chicago.

Subscribe for the Iron Trade Review, $3 per year.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

THE JACKSON SAND MINING CO.,

JACKSON, O.

Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6¾ to 7¾	2.50 extra.
¼ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
⅜ to 15-16 x ⅜ to ⅞	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
½ to 9-16 x ⅜ to ⅞	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1½ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No 9 to 3-16	1 30 "
7-16 to ½ x Nos. 10, 11 and 12	1 40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1⅛	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅞ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.
		Extras.
1½ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15
1 7-16 to 1⅜,	" 22	.25
1 ⅜ to 1⅜,	" 13, 14 and 15	.05
1⅜ to 1⅜	" 16, 17 and 18	.10

F. A. ESTEP, Pres. & Treas. J. R. McGINLEY, Vice Pres't. THOS. FAWCUS, Supt.

CUT GEARS
FOR
HEAVY DUTY

Are Wonderful Economizers of Power.

Have you looked into this?
If not, it will pay to do so.
Then write us for prices.

R. D. 99 ALLEGHENY,

This is 4-inch Circular Pitch.

We Cut Involute, Epicycloidal or Special Teeth.

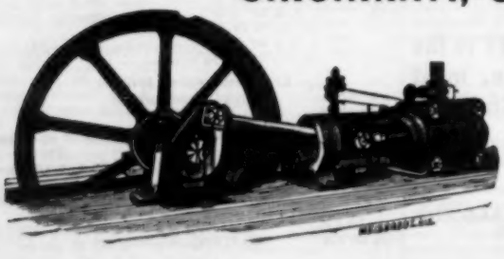
Nuttall Co., Grant Ave., PA.

Spur, Bevel or Spiral Gears. **Racks, Quadrants and Worm Gearing.**

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE LANE & BODLEY CO.,
CINCINNATI, OHIO.



Engines,
ALL SIZES.
Simple and Compound.
Shafting, Hangers, Pulleys.
Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞, Nos.		13, 14 and 15	.20 "
⅞, "		16, 17 and 18	.25 "
⅞, "		19 and 20	.30 "
⅞, "		21	.35 "
⅞, "		22	.45 "
¾ and 13-16 Nos.		13, 14 and 15	.30 "
¾ and 13-16 "		16, 17 and 18	.35 "
¾ and 13-16 "		19 and 20	.40 "
¾ and 13-16 "		21	.45 "
¾ and 13-16 "		22	.50 "
¾ and 13-16 "		23	.60 "
11-16, Nos.		13, 14 and 15	.35 "
11-16, "		16, 17 and 18	.40 "
11-16, "		19 and 20	.50 "
11-16, "		21	.60 "
11-16, "		22	.70 "
11-16, "		23	.80 "
⅝, Nos.		13, 14 and 15	.40 "
⅝, "		16, 17 and 18	.45 "
⅝, "		19 and 20	.55 "
⅝, "		21	.65 "
⅝, "		22	.75 "
⅝, "		23	.85 "
9-16, "		13, 14 and 15	.45 "
9-16, "		16, 17 and 18	.50 "
9-16, "		19 and 20	.60 "
9-16, "		21	.70 "
9-16, "		22	.80 "
9-16, "		23	.90 "
½, "		13, 14 and 15	.55 "
½, "		16, 17 and 18	.60 "
½, "		19 and 20	.70 "
½, "		21	.80 "
½, "		22	.90 "
½, "		23	1.00 "
7-16, "		13, 14 and 15	.80 "
7-16, "		16, 17 and 18	.90 "
7-16, "		19 and 20	1.00 "
7/16, "		13, 14 and 15	1.00 "
7/16, "		16, 17 and 18	1.10 "
7/16, "		19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

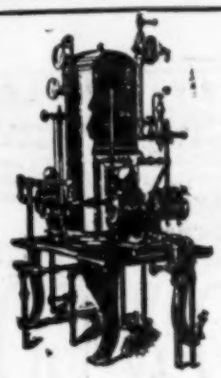
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



IMPROVED DUPLEX SYSTEM

- - - FOR - - -

BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

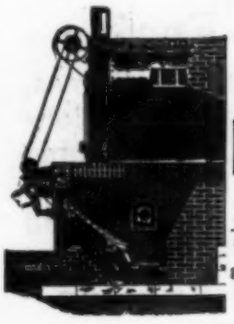
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ¾ thick .08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts. lbs.

1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¾ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 60
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 55

Wrought Pipe and Boiler Tubes.

Lap weld black,	base,	four	10s	.62
Butt "	"	"	10s	.62½
Lap "	galv.	"	10s	.52½
Butt "	"	"	10s	.50
Boiler tubes 2¼" and smaller				.70
Boiler tubes 2½" and larger				.75
Casting screw and socket joint				dis. 52½
Casing inserted joint				dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.

No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.

Mystic Metal. 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 30
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3¼
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills

Morse Taper&Straight Shank to 1¼"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 in 46 gr.	Flour, 150 gr.	C. F F. F
Kegs, ℔ lb	4½c	5 c	2¾c
½ kegs ℔ lb	4¼c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	¼c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Crant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyc.one ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1897 ..... dis 50
Heavy hammers and sledges under 5 lbs 10c
" " " " over 5 lbs 8c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3⅛
Hexagon	15⅝	11⅛	8½	6	5¾	5⅛	
Washers	9	8	7	5	4⅛	4⅛	4⅛

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg, base.
Car lots $1 30
Less than car lots $1 40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 30

Wire.

New List, Apr. 9, 1894

Brass ..... dis 35
Copper ..... dis 35c
Bright and annealed, Nos. 0@18 ..... dis 70&10&7½
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis65& 5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 50

THE PHILLIPS

Testing Laboratory.

WM. B. PHILLIPS. DAVID HANCOCK.

All Kinds of Chemical Work. Reports on Mining Property and Technical Processes.

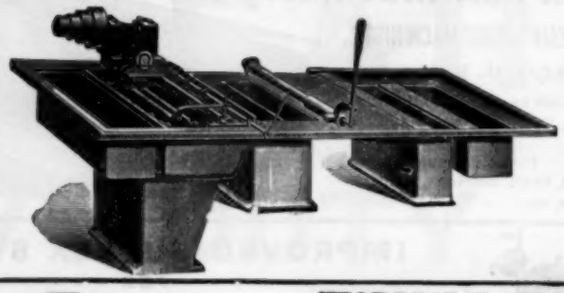
Office and Laboratory at Birmingham Rolling Mill

BIRMINGHAM, ALABAMA.

Address, P. O. Box 346.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY



Rolling Mills, Sand and Chill ROLLS.

WORLD'S FAIR AWARD.

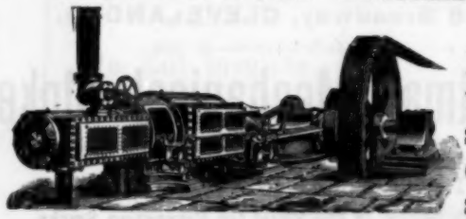
We are the only Steel Roofing Co. awarded Medal and Diploma for PATENT CAP ROOFING at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES-IRON & STEEL ROOFING CO., - Chicago and Niles, O.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



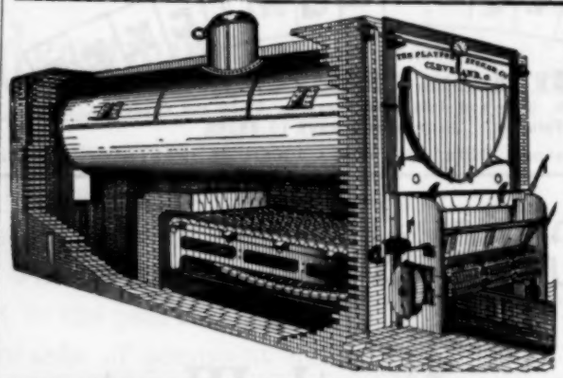
Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y.
E. F. WILLIAMS.

Park Building, Pittsburg,
SEWARD S. BABBITT.



The Playford Mechanical Stoker

Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

No. 61 Case Library Bldg.,
CLEVELAND, O.

Lunkenheimer's "Regrinding" CHECK VALVES

made of gun metal have gained an international reputation for superiority. This valve is constructed on practical principles and will not stick or pound.

Carefully made, tested and every valve warranted.

Specify Lunkenheimer make and see that name is on every valve. None genuine without. Catalogue free for the asking.

THE LUNKENHEIMER COMPANY,

Cincinnati, Ohio, U. S. A.

SOLE MANUFACTURERS.

26 Cortlandt St., NEW YORK. } BRANCHES { 35 Great Dover St. LONDON, S. E.

BELT DRIVEN DIRECT DRIVEN
DYNAMOS AND MOTORS
SLOW SPEED HIGH GRADE

THE CARD ELECTRIC CO.
MANSFIELD, OHIO, U.S.A.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
T. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 Wilshire Bldg., Cleveland, O.
C. A. BURWELL, Chief Inspector, 32 Wilshire Bldg., Cleveland, O.
J. E. WOLCOTT, Special Agent, Room 32, Wilshire Bldg., Cleveland, O.

CLEVELAND ELECTROTYPE CO.
ELECTROTYPING ENGRAVING AND STEREOTYPING.
50 HIGH ST. — TEL. 2139.

ESTABLISHED 1854.
PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio, U. S. A.

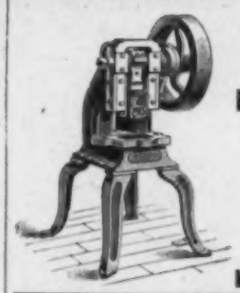
THE BETHLEHEM IRON CO.,
WORKS AND PRINCIPAL OFFICE,
SOUTH BETHLEHEM, PENNA.

RAILS, BILLETS, MUCK BARS.

FORGINGS of all descriptions, either Solid or Hollow, made from Fluid-Compressed, Hydraulic Forged Open Hearth Steel.
PLATES for all purposes.

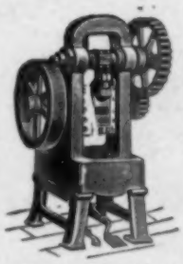
NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.
CHICAGO OFFICE, MARQUETTE BUILDING.

PERKINS POWER PRESSES



We are the Largest Manufacturer of PRESSES and DIES in NEW ENGLAND.
PERKINS MACHINE CO.
FACTORY AND OFFICE:
K and East 1st Sts., South Boston, Mass.

TOLEDO MACHINE & TOOL CO.,
501-505 Superior St., Toledo Ohio.



No. 54 Power Press

We manufacture
Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
Riveting Machines. Power Shears.
Special and Automatic Machinery Dies for all classes of work in sheet metals.
Write for catalogue and prices.

No. 75 Power Press

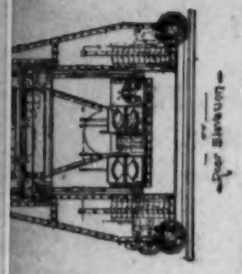
THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO., Limited,
Office and Works at CLEARFIELD, PA.
Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

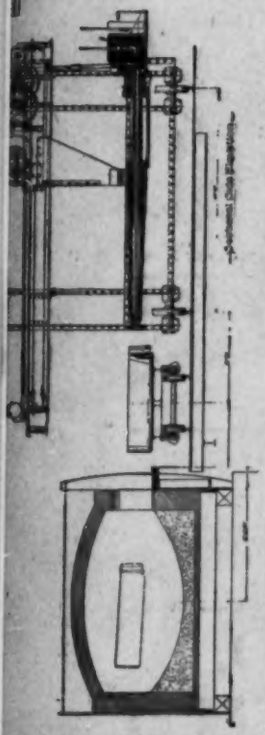
KING'S SIX TON ELECTRIC CRANE
Can be furnished at low cost.
Write for full information to the MARION STEAM SHOVEL CO Marion, Ohio.

B. P. CRANE & CO.
TIN & TERNE PLATES
L. D. Telephone, MAIN 841. 205 LA SALLE ST.
CHICAGO.

FIRE DOVER FIRE BRICK CO., BRICK
MANUFACTURERS OF
Furnace, Mill and Special Shape Fire Brick.
Office, 44 Mercantile Bank Bldg.,
CLEVELAND, OHIO.

THE
WELLMAN,
SEAVER
ENGINEERING CO.,
1405
New England Bldg.,
CLEVELAND, O.
ENGINEERS
AND
CONTRACTORS.





Sectional View of
WELLMAN
CHARGING
MACHINE.

Sole proprietors of patents on charging machines and method of charging open hearth furnaces.

Any infringements on these patents will be rigorously prosecuted.

THE HART OR DETROIT
Emery Corundum Wheels and Machinery.
Write to J. WENDELL COLE, M. E.,
District Manager, No. 911 Chicago Opera House Block, Chicago, Ill., or Box 84, Columbus, O
N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

THE HARRINGTON & KING PERFORATING CO.
CHICAGO.

METALS PERFORATED AS REQUIRED FOR
SCREENS OF ALL KINDS
AND FOR USE IN

Milling and Mining Machinery	Stone, Coal and Ore Screens
Reduction and Concentrating Works	Stamp Battery Screens
Woolen, Cotton, Paper and Pulp Mills	Brick and Tile Works, Filters
Rice, Flour and Cottonseed Oil Mills	Spark Arresters, Gas and Water Works
Sugar and Malt Houses	Oil, Gas and Vapor Stoves
Distilleries, Filter Presses	Coffee Machinery, etc., etc.

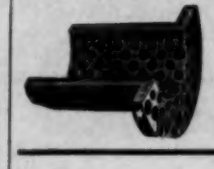
Standard Sizes Perforated Tin and Brass Always in Stock.
Main Office and Works: 226 North Union Street, Chicago, Ill., U.S.A.
Eastern Office: No. 284 Pearl Street, New York.

MEEHAN BOILER & CONSTRUCTION CO.,
LOWELLVILLE, OHIO,
MANUFACTURERS OF
MEEHAN'S COMBINED SAFETY and WATER TUBE BOILER.
All kinds of Blast Furnace, Steel Plants and Stand Pipe Work.
Also all kinds of Oil Refinery and Tank Work.
WROUGHT IRON WELDED and RIVETED ANNEALING BOXES.
Structural and Engineering Work

FARMERS
are appreciating the
Charter Gasoline Engine,
Stationaries, Portables, and Tractions.
Proof by addressing
Charter Gas Engine Co., 300 Second Street, STERLING, ILL.

BORING AND TURNING MILLS,
4, 5 & 6 Ft. Swing.
H. Bickford,
Lakeport,
N. H.
Send for Photograph and Low Price.

OILLESS BEARINGS



For Loose Pulleys and other bearings. Perfectly clean. No cutting or danger of fire from overheating. Send for Loose Pulley circular.
No. American Metaline Co.
40 to 48 Third Street, Long Island City, N. Y.

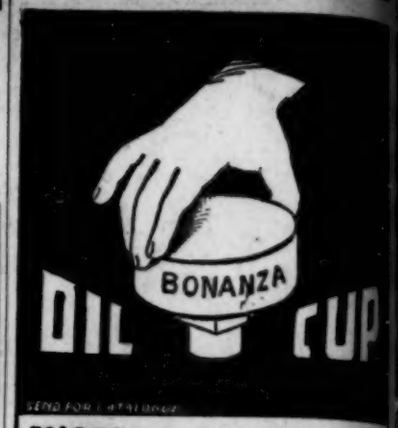
IT PAYS TO ADVERTISE IN
THE IRON TRADE REVIEW

The Iron Trade Review
Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests.
Per year $3.00.

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, Ohio; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."



CHARLES H. BESLY & CO.
METAL-WORKERS' FINE TOOLS & SUPPLIES
10-12 N. CANAL ST. CHICAGO

LEADS THEM ALL,
THE
Harrington
Chain Block.
Made in Philadelphia Only.
EDWIN HARRINGTON
SON & CO., Inc.,
1526 Penna. Ave., PHILA., PA.
Improved Machine Tools.

ENGINE LATHES.
14" to 42" SWING.

THE LODGE & SHIPLEY M. T. CO.
Culvert & Harrison Streets,
CINCINNATI, O.

"Metallurgy of Cast Iron,"
Price $3.

"HAMMOND" AND "ACME"
HIGH GRADE FIRE BRICK
ARE THE BEST.
MANUFACTURED BY
Reese, Hammond & Co.,
BOLIVAR, PA.
Specialties: Tile, Grate Settings, Stove Lining and Difficult Shapes to order. Cupola Blocks.